

desmos

Workbook



Your Name: _____

Your Teacher's Name: _____

Unit 2 Linear Equations and Inequalities

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Unit A1.2, Learning Goals

Section 1: One-Variable Equations

Lesson 1: Hang On

Solving Equations With Balanced Moves

- ☐ I can determine a solution to an equation by modeling it with a hanger diagram.
- ☐ I can describe balanced moves and use them to solve an equation.

Lesson 2: Working Backwards

Solving Equations With Inverse Operations

- ☐ I can describe and use inverse operations to solve an equation.

Lesson 3: Equivalent Equations

Steps for Solving Equations

- ☐ I can explain whether two equations are equivalent.
- ☐ I can justify that a step used in solving a linear equation creates an equation with the same solution.

Lesson 4: Solving Strategies

More Solving With One-Variable Equations

- ☐ I can analyze others' reasoning when solving equations.
- ☐ I can solve one-variable linear equations.

Lesson 5: Same Position

No Solution and Infinite Solutions

- ☐ I can describe the effect of dividing by a variable when solving an equation.
- ☐ I can justify whether a one-variable equation has one solution, no solution, or infinite solutions.

Section 2: Multi-Variable Equations

Lesson 6: Subway Seats

Representing Situations With Two-Variable Equations

- ☐ I can represent constraints using two-variable equations and interpret their solutions.
- ☐ I understand that different forms of a linear equation can be useful for different purposes.

Lesson 7: Various Variables

Solving Multi-Variable Equations

- ☐ I understand what “to solve for a variable” means.
- ☐ I can solve an equation with multiple variables for one of the variables.

Lesson 8: Shelley the Snail

Connecting Graphs and Linear Equations

- ☐ I understand that the graph of a linear equation represents all the solutions to the equation.
- ☐ I can solve an equation for one of its variables and connect my new equation to its graph.

Unit A1.2, Learning Goals

Lesson 9: Five Representations

Linear Relationships in Equations, Tables, and Graphs

- ☐ I can make connections between equations, tables, descriptions, and graphs.
- ☐ I can write two linear equations to represent the same situation.

Section 3: One-Variable and Two-Variable Inequalities

Lesson 10: Pizza Delivery

Representing Situations With One-Variable Inequalities

- ☐ I understand what a solution to an inequality is.
- ☐ I can interpret and write one-variable inequalities that represent constraints.

Lesson 11: Graphing Inequalities

Inequalities on the Number Line

- ☐ I can solve one-variable inequalities by reasoning.
- ☐ I can graph solutions to a one-variable inequality on the number line.

Lesson 12: Solutions and Sheep

Solving One-Variable Inequalities

- ☐ I can solve a one-variable linear inequality using its corresponding equation.

Lesson 13: Bracelet Budgets

Introduction to Two-Variable Inequalities

- ☐ I can interpret what two-variable inequalities represent in a situation.
- ☐ I can show and explain what it means to be a solution to a two-variable inequality.

Lesson 14: All of the Solutions

Graphing Solutions to Two-Variable Inequalities

- ☐ I understand how solutions to a two-variable linear inequality are represented on a graph.
- ☐ I can graph the solutions to a linear two-variable inequality given the graph of its corresponding line.

Lesson 15: Charity Concerts

Graphing Two-Variable Inequalities in Context

- ☐ I can graph the solutions to a two-variable linear inequality and interpret its solutions in context.

Lesson 16: Water Way

Using Two-Variable Inequalities to Make Decisions

- ☐ I can use two-variable linear inequalities to analyze an issue in society.

Activity 1: Two Truths and a Lie

For each problem, two of the equations are equivalent to the equation on the left, and one is not. Circle the equation that **is not** equivalent to the equation on the left.

1. $3x + 6 = 4x + 7$

A. $3x = 4x + 1$

B. $6 = 7x + 7$

C. $3x - 1 = 4x$

2. $3(x + 6) = 24$

A. $x + 6 = 21$

B. $3x + 18 = 24$

C. $x + 6 = 8$

3. $-12 = -2x + 8$

A. $-12 = -2(x - 4)$

B. $-4 = -2x$

C. $6 = 1x - 4$

4. $-3 + 6x + 1 = 19$

Write two equations that are equivalent to this equation and one that is not.

A. _____

B. _____

C. _____

Trade with a classmate.

Name _____

Which equation is not equivalent? _____

5. Select **two** of the equations above and solve them.

Equation: _____

Equation: _____

Activity 2: Step It Up

For each pair of equations, determine if they are equivalent (have the same solution).

- If yes, explain how to get from one equation to the other.
- If not, explain how you know and write a second equation that **is** equivalent.

My Equations	Are the equations equivalent? _____ Explanation:
_____’s Equations	Are the equations equivalent? _____ Explanation:
_____’s Equations	Are the equations equivalent? _____ Explanation:
_____’s Equations	Are the equations equivalent? _____ Explanation:

Activity 1: Step It Up

Amir and Sadia both correctly solved the equation $6 - 7x = \frac{-15x-12}{3}$.

Here are their steps:

Sadia

Step 1: $6 - 7x = \frac{-15x-12}{3}$

Step 2: $6 - 7x = -5x - 4$

Step 3: $10 - 7x = -5x$

Step 4: $10 = 2x$

Step 5: $5 = x$

Amir

Step 1: $6 - 7x = \frac{-15x-12}{3}$

Step 2: $18 - 21x = -15x - 12$

Step 3: $18 - 6x = -12$

Step 4: $-6x = -30$

Step 5: $x = 5$

1. Discuss: What did Sadia do at each step? What did Amir do at each step?

2. Show that $x = 5$ is a solution to the equation.

3. Caleb and Roberto also solved the equation, but they made some errors.

Circle the incorrect step in each student's work and explain why it is incorrect.

Caleb

Step 1: $6 - 7x = \frac{-15x-12}{3}$

Step 2: $-1x = -5x - 4$

Step 3: $4x = -4$

Step 4: $x = -1$

Roberto

Step 1: $6 - 7x = \frac{-15x-12}{3}$

Step 2: $6 - 7x = -5x - 4$

Step 3: $2 - 7x = -5x$

Step 4: $2 = 2x$

Step 5: $1 = x$

Activity 2: Least and Most Difficult

Your teacher will give you a set of equations. Without solving, find three equations that you think would be less difficult to solve and three you think would be more difficult to solve.

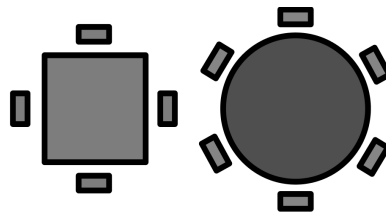
Less Difficult Cards	More Difficult Cards
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Activity 3: Solve 'em

Look through the equations and choose four to solve. At least one should be from your "less difficult" list and one should be from your "more difficult" list.

Activity 1: Sol's Strategies

Sol is planning a party. They can use round tables and square tables. Round tables seat 6 people and square tables seat 4 people.



- Sol wrote $6r + 4s = 240$ to represent this situation.
Explain what each number and variable in Sol's equation means.
- How many square tables does Sol need if they has 16 round tables?
Show or explain your thinking.

- Sol solved the equation for s .
How could they use this new equation?

$$\begin{array}{r}
 6r + 4s = 240 \\
 -6r \qquad \qquad -6r \\
 \hline
 4s = 240 - 6r \\
 \frac{4s}{4} = \frac{240 - 6r}{4} \\
 s = 60 - 1.5r
 \end{array}$$

- Use Sol's new equation to decide how many **square tables** they need if they have 10 round tables.
- How many **round tables** does Sol need if they have 18 square tables?
- Solve Sol's original equation $6r + 4s = 240$ for r .

Activity 2: Equations and Formulas

Solve the equation on the left. Then use your work to help you solve the equation on the right.

Solve for t . 1.1 $12 = 3t$

1.2 $D = rt$

Solve for b . 2.1 $20 = b \cdot 5$

2.2 $A = bh$

Solve for x . 3.1 $2x + 5 = 12$

3.2 $mx + b = y$

Discuss how solving the equations on the left is similar to solving the equations on the right.

Solve for x . 4.1 $-5x - 2 = 13$

4.2 $-kx - p = w$

Solve for a . 5.1 $\frac{a}{5} - 18 = 2$

5.2 $\frac{a}{g} - r = c$

Solve for h . 6.1 $289 = \pi(2^2)h$

6.2 $v = \pi(r^2)h$

Activity 1: Match It

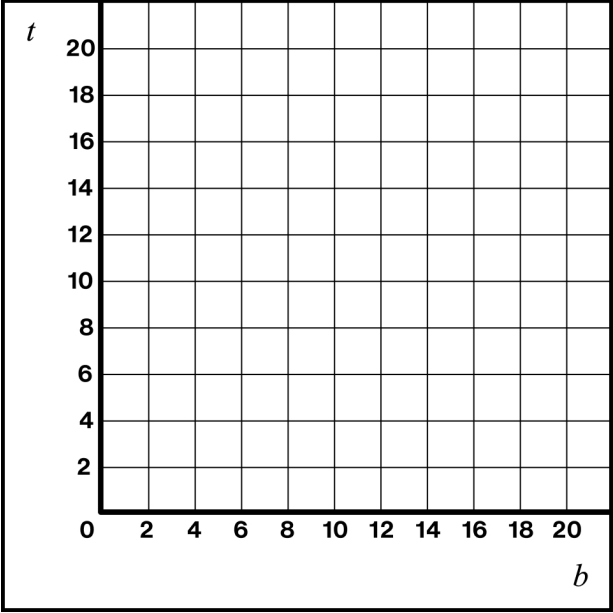
1. Match the three cards that your teacher gave you to the correct description.
2. Create the missing representations.

	Burgers	Bracelets
Description	<p>A family bought 2 hamburgers and 4 salads at the fair. Their total was \$32.</p> <p>Use x for the price of a hamburger.</p> <p>Use y for the price of a salad.</p>	<p>Vihaan sold 4 bracelets at the fair. To make the bracelets, he bought 8 packs of beads. Vihaan made \$32 in total.</p> <p>Use x for the price of a bracelet.</p> <p>Use y for the cost of a pack of beads.</p>
Graph		
Equation in Standard Form		
Equation Solved for y		

Reflection: Where can you see the values from the equations in each graph?

Activity 2: Make It

Situation 1: Complete all of the representations of this situation.

Variables													
<ul style="list-style-type: none"> Let b represent the number of bus rides Kiana took last month. Let t represent the number of train rides Kiana took last month. 													
<p style="text-align: center;">Description</p> <p>Kiana spent \$40 riding the bus and the train last month.</p> <p>Each bus ride costs \$2.</p> <p>Each train ride costs \$2.50.</p>	<p style="text-align: center;">Equation in Standard Form</p> <hr/> <p style="text-align: center;">Equation Solved for t</p>												
<p style="text-align: center;">Table</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 5px;">b</th> <th style="padding: 5px;">t</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">0</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;"></td> <td style="padding: 5px;">12</td> </tr> <tr> <td style="padding: 5px;">10</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;"></td> <td style="padding: 5px;">4</td> </tr> <tr> <td style="padding: 5px;">20</td> <td style="padding: 5px;">0</td> </tr> </tbody> </table>	b	t	0			12	10			4	20	0	<p style="text-align: center;">Graph</p> <div style="text-align: center;">  </div>
b	t												
0													
	12												
10													
	4												
20	0												

Situation 2: Complete all of the representations of this situation.

Variables

- Let x represent _____.
- Let y represent _____.

Description

Equation in Standard Form

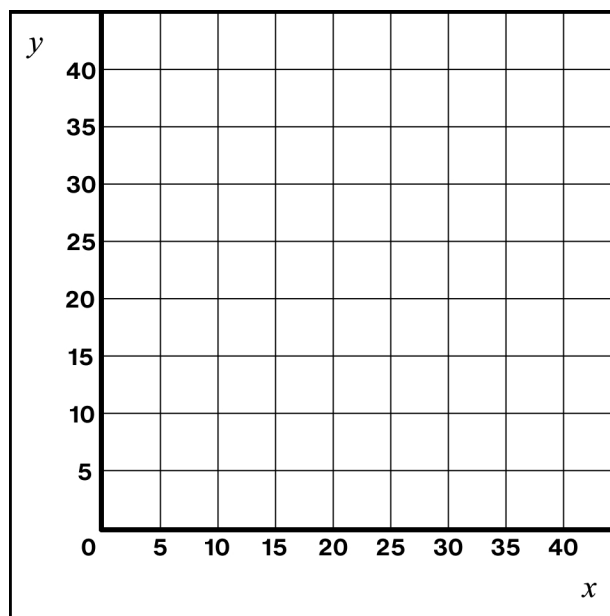
$$2x + y = 40$$

Equation Solved for y

Table

x	y
0	
5	30
	20
15	

Graph



Equations and Their Solutions

1.1	1.2	
1.3	2.	
3.	4.	5.

Snack Solving

<div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;">1.1</div> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr style="background-color: #d3d3d3;"> <th style="padding: 5px;">a</th> <th style="padding: 5px;">r</th> </tr> <tr> <td style="padding: 5px;">1</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">2</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">3</td> <td style="padding: 5px;"></td> </tr> </table> </div>	a	r	1		2		3		1.2	2.1	2.2
a	r										
1											
2											
3											

Very Many Variables

1.	2.	3.	4.
5.1	5.2	5.3	

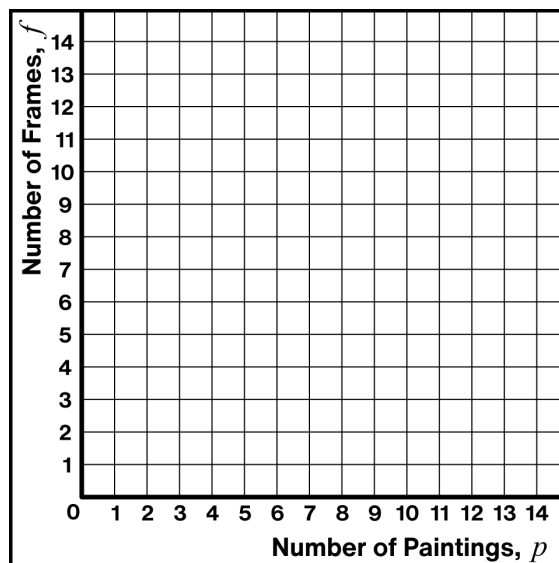
Equations, Tables, Graphs, and Solutions

1.

2.

3.

4.



Activity 1: SoundZone Concerts

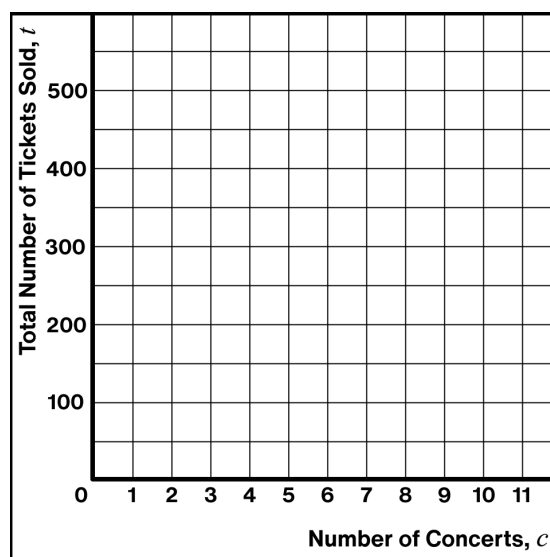
The Funk-tions are trying to raise at least \$2 000 for charity by holding multiple concerts at SoundZone. Each concert at SoundZone costs them \$500. They sell tickets for \$20 each.

1. Will the band reach their goal if they hold 2 concerts and sell 100 tickets total?

2. The band manager wrote the equation $-500c + 20t = 2000$.
Show or explain what each part of the equation represents.

3. Graph the band manager's equation.
Use the table if it helps with your thinking.

Number of Concerts, c	Total Number of Tickets Sold, t



4. Write an inequality that represents all the combinations of concerts and tickets that would raise **at least** \$2 000 for charity.

5. Shade in the region on the graph that represents all the solutions to the inequality you wrote.

6. Write a question that the Funk-tions could answer using the graph.

Activity 2: Which Venue?

The Funk-tions are considering two other venues for their charity concerts.

Circle one venue to explore in problems 1–3 below. Your partner should select the *other* venue.

The Hideout

Cost per concert: \$250

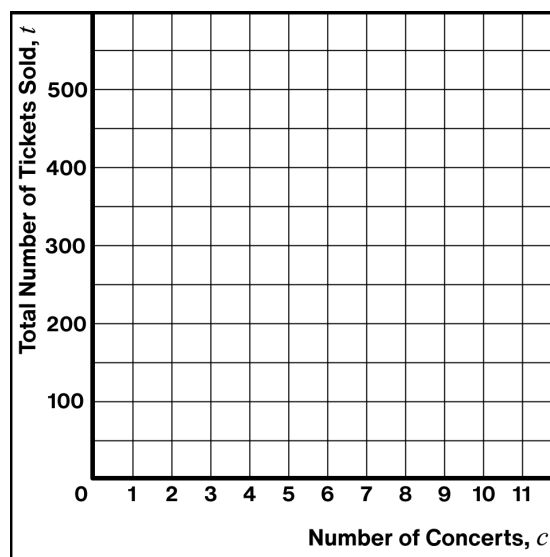
Ticket price: \$10

Palace Arena

Cost per concert: \$4 000

Ticket price: \$40

- Write an inequality that represents the number of concerts and tickets sold that would raise **at least** \$2 000 at the venue you chose.
- Graph the solutions to that inequality.
Graph the equation first if it helps with your thinking.



- Compare your and your partner's graphs. *How are the graphs alike? How are they different?*

For each situation, work with your partner to determine which concert venue you would recommend. Be prepared to explain your thinking.

- | | | | |
|-----|----------------------------------|-------------|--------------|
| 4.1 | 1 concert and 200 tickets total | The Hideout | Palace Arena |
| 4.2 | 5 concerts and 400 tickets total | The Hideout | Palace Arena |
| 4.3 | 3 concerts and 500 tickets total | The Hideout | Palace Arena |

Activity 1: The Desmosia River Agreement

Each year, two cities share up to 500 billion gallons of water that flow from the Desmosia River. As the head of water management, your job is to decide how to fairly share the water between City A and City B next year.

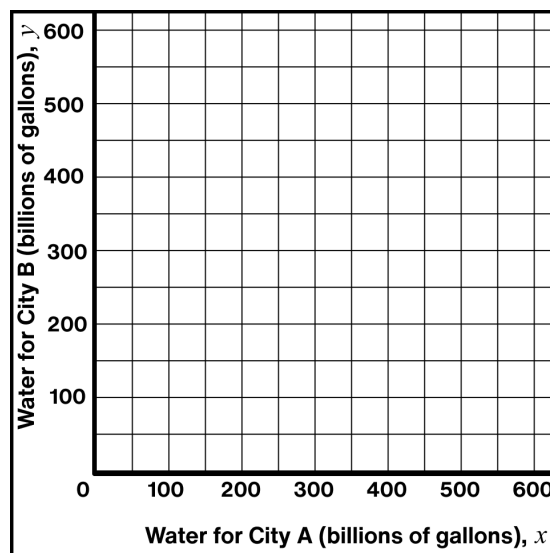
- Write an inequality that represents all the ways you could distribute the water.
 - Use x to represent the gallons of water, in billions, for City A.
 - Use y to represent the gallons of water, in billions, for City B.

- Graph the solutions to your inequality.

- How would you fairly distribute the water?

Water for City A (billions of gallons)	Water for City B (billions of gallons)

- What information would help you make a more fair decision?



Activity 2: Information Cards

Your teacher will give each person in your group more information about the situation.

- Take turns reading the information on your card to your group.
 - After each card, discuss: *How could this help us make a more fair decision?*
 - Answer problems 1 and 2 below.
- Is your original decision still fair for both cities? Why or why not?
 - As a group, decide the most fair way to distribute the water.
Be prepared to share your thinking.

Water for City A (billions of gallons)	Water for City B (billions of gallons)

Activity 3: Perspectives

Here are two people that live in City A and City B.

Dalia is a farmer in City A. She grow crops on a farm that borders the Desmosia River. Most of her crops are sold to restaurants and grocery stores in City B.

Ricardo lives in a large apartment building in City B. His water usage bill has been increasing each year. More water will reduce the cost of water for all residents in City B.

1. Who would be **less** happy with your group's decision?

2. What would you say to help them understand your decision?

Explore

The 1922 Colorado River Compact is an agreement between 7 states (Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming) to fairly distribute the 5 billion gallons of water that flow through the Colorado River each year.



AZ	CA	CO	NV	NM	UT	WY
19%	29%	25%	2%	6%	12%	7%

What are some factors that you would consider when making a decision like this?

Set A

Show your thinking for the problems below.

1. Solve $3x - 1 = 4(x + 2)$.

2. Solve $3 = 6x + 11 + 2x$.

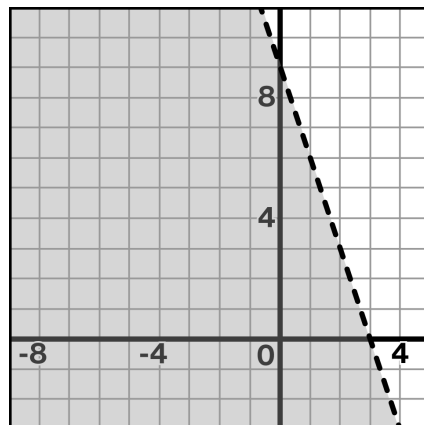
3. Solve this inequality:
 $-4(3m - 1) \leq 2m - 24$

4. Solve for y :
 $y - 18x = 12$

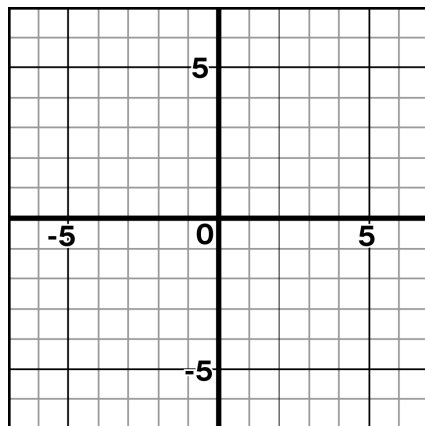
5. Solve for h :
 $9y = 6x - 3h$

6. Which inequality matches the graph?

- A. $3x + y > 9$
- B. $3x + y < 9$
- C. $x - 9y > 3$
- D. $x + 9y < 3$



7. Graph all the solutions to the inequality
 $-2x + 4y \leq -12$.



Here's an inequality: $2x + y < 8$.

8.1 Select **all** the coordinate pairs that are solutions to the inequality.

☐ (0, 0)

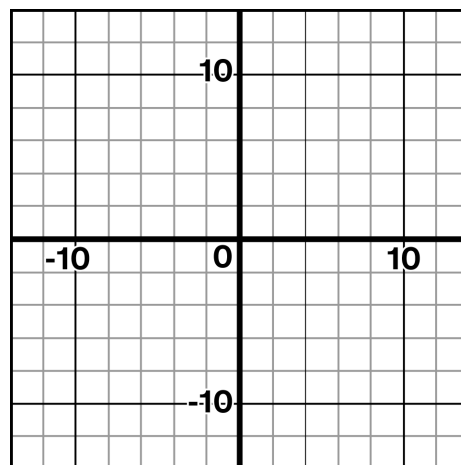
☐ (5, -2)

☐ (-1, 4)

☐ (-3, -5)

☐ (7, 7)

8.2 **Graph** all the solutions to the inequality.



The city of Metropolis holds an outdoor concert every summer. Two kinds of tickets are sold: lawn tickets and seat tickets. Fewer than 400 tickets in total were sold.

9.1 Write an inequality that describes this situation. Describe what each variable represents.

9.2 Write the coordinates of one solution to the inequality and explain what it represents in this situation.

At the concert in Metropolis, lawn tickets cost \$30 and seat tickets cost \$50. The concert organizers want to make at least \$8 000 from ticket sales.

10.1 Write an inequality that describes this situation.

10.2 Write the coordinates of one solution to the inequality and explain what it represents in this situation.

11. Are there any coordinates that are solutions to **both** inequalities in problems 9 and 10? Explain your thinking.

Set B

Show your thinking for the problems below.

1. Solve $2(4 - x) = -5x - 19$.

2. Solve $6x - 4 + 3x = -13$.

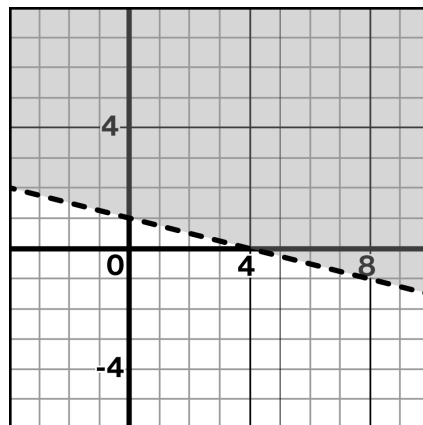
3. Solve this inequality:
 $10m + 15 \leq -7(-2m - 1)$

4. Solve for y :
 $0 = 12 - y + 18x$

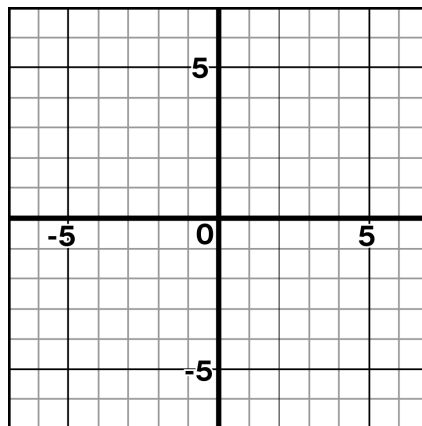
5. Solve for h :
 $2h - 4x = -6y$

6. Which inequality matches the graph?

- A. $x - 4y > 4$
- B. $x + 4y > 4$
- C. $4x - y < 4$
- D. $4x + y < 4$



7. Graph all the solutions to the inequality
 $-x + 2y \leq -6$.

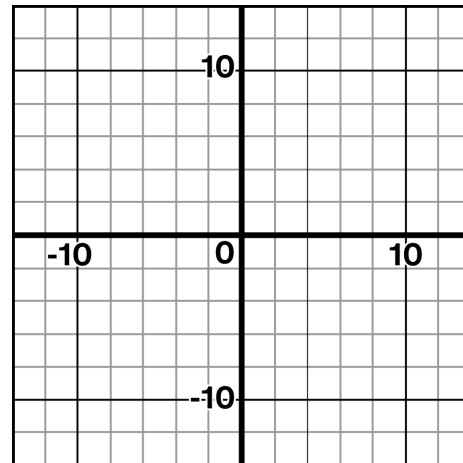


Here's an inequality: $6x + 3y < 24$.

8.1 Select **all** the coordinate pairs that are solutions to the inequality.

- ☐ (0, 0)
- ☐ (5, -2)
- ☐ (-1, 4)
- ☐ (-3, -5)
- ☐ (7, 7)

8.2 **Graph** all the solutions to the inequality.



At Treetop Adventure Park you can buy tickets for the zip line adventure or the high ropes obstacle course. Fewer than 400 tickets in total were sold.

9.1 Write an inequality that describes this situation. Describe what each variable represents.

9.2 Write the coordinates of one solution to the inequality and explain what it represents in this situation.

At Treetop, zip line tickets cost \$30 and high ropes tickets cost \$50. Treetop wants to make at least \$8 000 from ticket sales.

10.1 Write an inequality that describes this situation.

10.2 Write the coordinates of one solution to the inequality and explain what it represents in this situation.

11. Are there any coordinates that are solutions to **both** inequalities in problems 7 and 8? Explain your thinking.

Lesson 1: Solving Equations With Balanced Moves

Summary

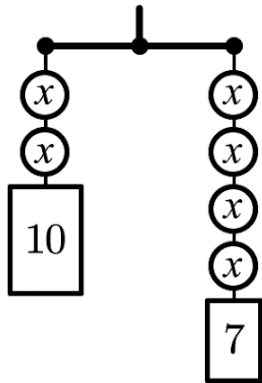
Solving an equation means determining all the values that make an equation true.

Hanger diagrams can be useful to represent and help solve equations.

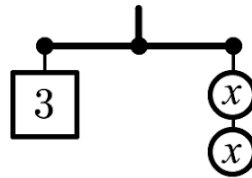
Here is Ayaan's work to solve the equation $2x + 10 = 4x + 7$.

Write what Ayaan did under each arrow.

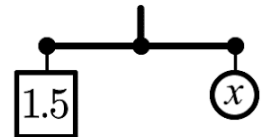
$$2x + 10 = 4x + 7$$



$$3 = 2x$$



$$1.5 = x$$



$x = 1.5$ is the *solution* to $2x + 10 = 4x + 7$. Explain what *solution* means in your own words.

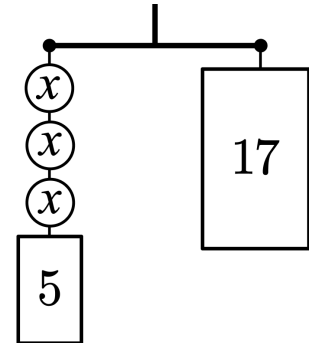
Things I Want to Remember

Lesson 1: Solving Equations With Balanced Moves

Try This!

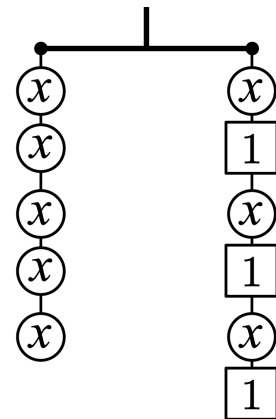
1. Solve the equation $3x + 5 = 17$.

Use the balanced hanger if it helps with your thinking.



2. Write an equation that this balanced hanger represents.

Solve the equation that you wrote.



3. Solve the equation $2x + 7 = 6x + 4$.

Draw a hanger if it helps with your thinking.



- ☐ I can determine a solution to an equation by modeling it with a hanger diagram.

☐ I can describe balanced moves and use them to solve an equation.

Lesson 2: Solving Equations With Inverse Operations

Summary

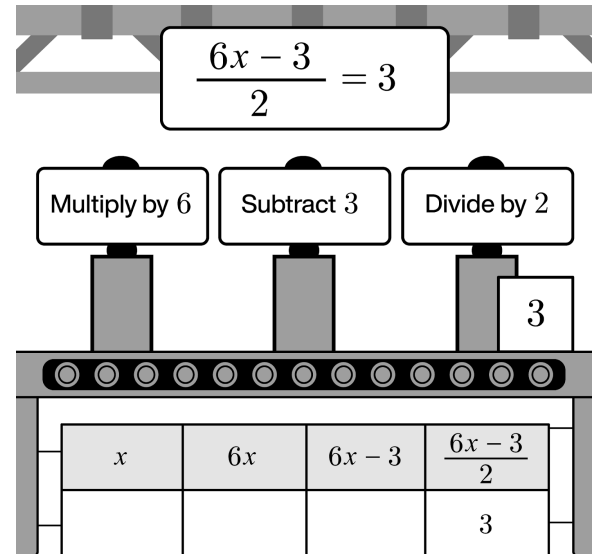
Working backwards can help solve equations.

A table and a number machine are two strategies for solving the equation $\frac{6x-3}{2} = 3$.

Show or explain how the table or number machine are each connected to the equation.

Solve the equation $\frac{6x-3}{2} = 3$.

Use the table or machine if it helps with your thinking.



Show that your solution is correct.

Things I Want to Remember

Lesson 2: Solving Equations With Inverse Operations

Try This!

1. Solve $-30 = -5(x + 2)$.

Use the table if it helps with your thinking.

x	$x + 2$	$-5(x + 2)$
		-30

Show that your solution is correct.

2. Use the table if it helps solve $\frac{3x + 9}{2} = 12$.

Use the table if it helps with your thinking.

x			$\frac{3x + 9}{2}$
			12

Show that your solution is correct.

☐ I can describe and use inverse operations to solve an equation

Lessons 3–4: Solving One-Variable Equations

Summary

Each step in solving an equation creates a new equation that is *equivalent* to the original.

We know they are equivalent because they have the same solutions.

Here is Juan’s work to solve the equation $2 - 4x = -2(3x - 4)$.

Explain what Juan did at each step.

Juan’s Work	
Step 1:	$2 - 4x = -2(3x - 4)$
Step 2:	$-1 + 2x = 3x - 4$
Step 3:	$3 + 2x = 3x$
Step 4:	$3 = x$

What errors might someone make when solving an equations like $2 - 4x = -2(3x - 4)$?

Show that $x = 3$ is the solution to **every** step of Juan’s work.

$$2 - 4x = -2(3x - 4)$$

$$-1 + 2x = 3x - 4$$

$$3 + 2x = 3x$$

$$3 = x$$

Things I Want to Remember

Lessons 3–4: Solving Equations in One Variable

Try This!

1.1 Solve $2(y + 1) = \frac{y - 4}{3}$ to show that the solution is $y = -2$.

1.2 Show that $y = -2$ is the solution to $2(y + 1) = \frac{y - 4}{3}$.

Juan made an error solving $-3(x - 2) = 1 - 2x$.

2.1 Describe one thing Juan did well.

2.2 Circle the step with the error.

2.3 Solve $-3(x - 2) = 1 - 2x$.

Juan's Work

Step 1: $-3(x - 2) = 1 - 2x$

Step 2: $-3x - 6 = 1 - 2x$

Step 3: $-3x - 7 = -2x$

Step 4: $-7 = x$

- ☐ I can explain whether two equations are equivalent.
- ☐ I can justify that a step in solving a linear equation creates an equation with the same solution.
- ☐ I can analyze others' reasoning when solving equations.
- ☐ I can solve one-variable linear equations.

Lesson 5: No Solution and Infinite Solutions

Summary

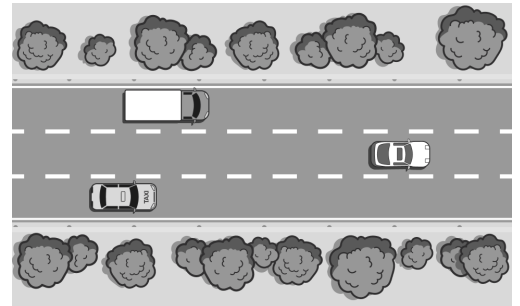
Linear equations can have *no solutions*, *one solution*, or *infinitely many solutions*.

- In an equation with *no solutions*, no value of x makes the equation true.
- In an equation with *infinitely many solutions*, every value of x makes the equation true.

The equation $t = t + 2$ has _____ solution(s).

If this equation represents the time, t , that two vehicles would be in the same position, then:

- They will never be in the same position.
- They will be in the same position after 2 seconds.
- They will always be in the same position.



The equation $2t = 8t$ has _____ solution(s).

If this equation represents the time, t , that two vehicles would be in the same position, then . . .

The equation $2t + 6 = 2(t + 3)$ has _____ solution(s).

If this equation represents the time, t , that two vehicles would be in the same position, then . . .

Things I Want to Remember

Lesson 5: No Solution and Infinitely Many Solutions

Try This!

Solve each equation and determine how many solutions it has.

1. $10x + 4 = 2(5x + 4)$

2. $10x = 5x - 12$

Circle one: No solution One solution Infinite solutions

Circle One: No solution One solution Infinite solutions

3. $10x = 5x$

4. $\frac{10x + 8}{2} = 5x + 4$

Circle one: No solution One solution Infinite solutions

Circle one: No solution One solution Infinite solutions

- ☐ I can describe the effect of dividing by a variable when solving an equation.
- ☐ I can justify whether a one-variable equation has one solution, no solution, or infinite solutions.

Lesson 6: Representing Situations With Two-Variable Equations

Summary

Sometimes equations have more than one variable in them. Different forms of the equation can be helpful in different situations.

Here are two equivalent equations about a subway car's capacity (i.e., the number of people who fit inside).

$$6t + 2d = 600$$

$$d = 300 - 3t$$

- t is the number of seats (seating capacity).
- d is the standing capacity.

Show the steps to solve $6t + 2d = 600$ for d .



When would it be useful to use the equation solved for d ?

Things I Want to Remember

Lesson 6: Representing Situations With Two-Variable Equations

Try This!

Tiara is saving \$240 for a new gaming console. To earn the money she needs, she works at the pool for \$8 an hour and earns \$12 an hour tutoring Spanish.

Tiara wrote the equation $8p + 12t = 240$ to represent her situation.

1. Explain what each part of $8p + 12t = 240$ represents in Tiara's situation.

2. Complete the table for the missing values of s .

p	s
3	
15	
18	

3. Which equation solved for t is equivalent to $8p + 12t = 240$?

- A. $t = 240 - 8p$ B. $t = 20 - \frac{2}{3}p$
 C. $t = 30 - \frac{3}{2}p$ D. $t = -\frac{2}{3}p + 30$

Show or explain how you know.

4. When might the equation that you chose in problem 3 be helpful to Tiara?

- ☐ I can represent constraints using two-variable equations and interpret their solutions.
☐ I understand that different forms of a linear equation can be useful for different purposes.

Lesson 7: Solving for a Variable

Summary

To solve for a variable means to write an equivalent equation that isolates the variable.

What does this mean in your own words?

Here are two equations. Solve each equation for t .

$$10 = 4 - 3t$$

$$10 = v - at$$

How would you explain solving an equation with multiple variables to a student who was absent?

Things I Want to Remember

Lesson 7: Solving for a Variable

Try This!

Solve each equation for m .

1.1 $\frac{m}{3} + 7 = -4$

1.2 $\frac{m}{a} + t = h$

Here is an equation: $4x - 8y = 16$.

2.1 Two of the equations below are equivalent to $4x - 8y = 16$.

Circle the equation that is **not** equivalent to $4x - 8y = 16$.

A. $2x - 4y = 8$

B. $8y = 16 + 4x$

C. $x = 4 + 2y$

2.2 Solve the equation $4x - 8y = 16$ for y .

- ☐ I understand what “to solve for a variable” means.
- ☐ I can solve an equation with multiple variables for one of the variables.

Lessons 8–9: Linear Relationships in Equations, Tables, and Graphs

Summary

Equations, tables, and graphs are different ways to model a situation.

Situation: A lemonade stand sells lemonade for \$3 per cup and cookies for \$2 each. They made \$12. Let l be the number of cups of lemonade sold and c be the number of cookies sold.

Show the steps to solve

$3l + 2c = 12$ for c .

Equation in Standard Form

$$3l + 2c = 12$$

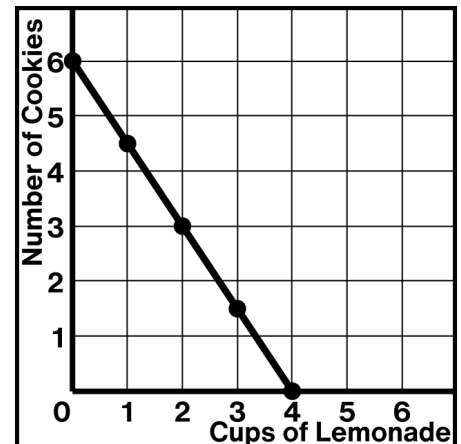
Equation Solved for c

$$c = 6 - \frac{3}{2}l$$

Table

l	0	2	4
c	6	3	0

Graph



Explain how **each** form of the equation is connected to the situation, table, or graph.

The equation $3l + 2c = 12$ is connected to the _____ because . . .

The equation $c = 6 - \frac{3}{2}l$ is connected to the _____ because . . .

Things I Want to Remember

Lessons 8–9: Rewriting Two-Variable Equations

Try This!

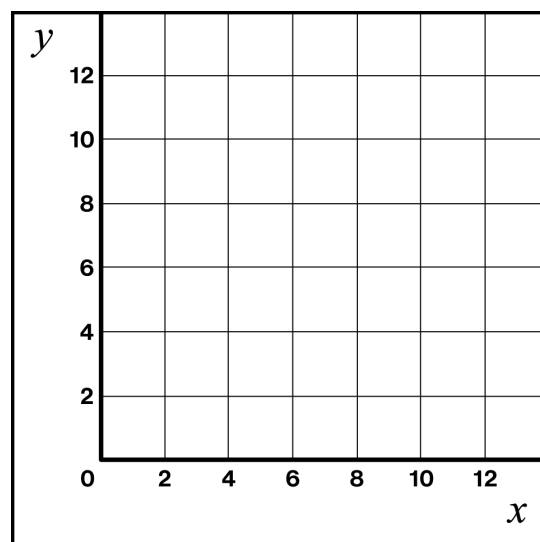
Here is an equation in standard form: $4x + 2y = 24$.

1. Solve $4x + 2y = 24$ for y .

2. Graph the equation $4x + 2y = 24$.

Make a table if it helps with your thinking.

x	y



3. Write a situation that $4x + 2y = 24$ could represent.

Write what x and y represent in your situation.

- ☐ I understand that the graph of a linear equation represents all the solutions to the equation.
- ☐ I can solve an equation for one of its variables and connect my new equation to its graph.
- ☐ I can make connections between equations, tables, descriptions, and graphs.
- ☐ I can write two linear equations to represent the same situation.

Lesson 10: Representing Situations With One-Variable Inequalities

Summary

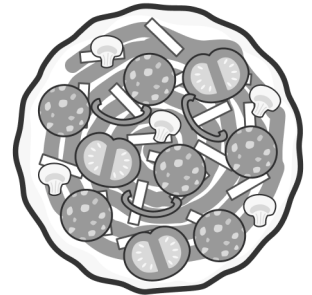
Writing and solving inequalities can help us make sense of *constraints*.

Here is one example of a constraint:

- Tasia is planning a pizza party and can spend up to \$140. Each plain pizza costs \$12 and there is a delivery fee of \$8.

Write an inequality to represent the constraint in this situation.

Use p to represent the number of pizzas Tasia can buy with her budget.



What are 2–3 other constraints people might consider when planning a party?

Write inequalities to represent each constraint.

Things I Want to Remember

Lesson 10: Representing Situations With One-Variable Inequalities

Try This!

Valeria wants to donate at least \$120 to her local food bank. She has already saved \$64 and is planning to save \$8 each week.

1. Why is Valeria's situation an example of a constraint?

2. Write an inequality to match Valeria's situation.

Use w to represent the number of weeks Valeria will save \$8.

3. Write some solutions to the inequality you wrote in problem 2.

4. What are some other constraints that Valeria could have in her situation?

- ☐ I understand what a solution to an inequality is.
- ☐ I can interpret and write one-variable inequalities that represent constraints.

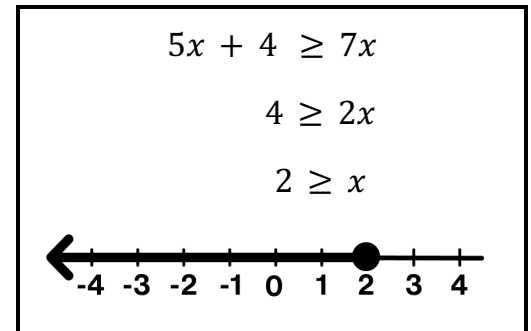
Lessons 11 and 12: Graphing and Solving One-Variable Inequalities

Summary

Solutions to one-variable inequalities can be represented on a number line.

List some solutions to $5x + 4 \geq 7x$.

Is $x = 2$ a solution to $5x + 4 \geq 7x$?
Explain how you know.



Strategies for solving equations can help solve inequalities.

Let's solve the inequality $10 - 5x < 0$.

1. Show that the solution to its corresponding equation $10 - 5x = 0$ is $x = 2$.

2. Test values of x that are less than and greater than 2 in the inequality $10 - 5x < 0$.

3. What are the solutions to $10 - 5x < 0$? _____

Things I Want to Remember

Lessons 11 and 12: Graphing and Solving One-Variable Inequalities

Try This!

1.1 Select **all** the values of x that are solutions to $-8x > 40$.

☐ $x = 10$

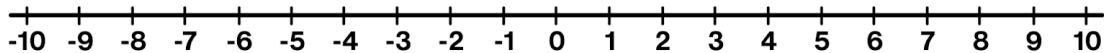
☐ $x = 5$

☐ $x = -10$

☐ $x = -5$

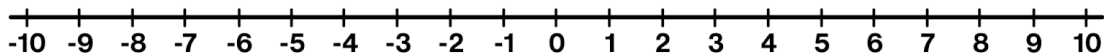
☐ $x = -6$

1.2 Graph all the solutions to $-8x > 40$ on the number line.



2.1 Solve $11 - 2x \leq 3$. Use its corresponding equation if it helps with your thinking.

2.2 Graph the solutions to $11 - 2x \leq 3$ on the number line.



3. Here is Marco's work to solve and graph $3 - 2x > 3$.

Explain the error Marco made in his work.

$$3 - 2x > 3$$

$$-2x > 6$$

$$x > -3$$

- ☐ I can solve one-variable inequalities by reasoning.
☐ I can graph solutions to a one-variable inequality on the number line.
☐ I can solve a one-variable linear inequality using its corresponding equation.

Lesson 13: Introduction to Two-Variable Inequalities

Summary

Graphs can help us visualize the solutions to two-variable inequalities.

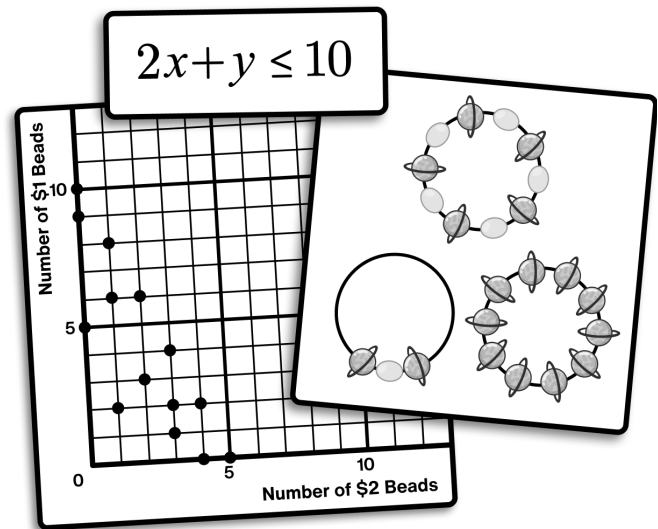
Marco is making bracelets.

Planet beads cost \$1 and oval beads cost \$2.

Show or explain what each part of $2x + y \leq 10$ represents in Marco's situation.

Choose a point shown on the graph. _____

Show that this point is a solution to $2x + y \leq 10$.



Choose a point that is **not** shown that you think is also a solution. _____

Show that this point is a solution to $2x + y \leq 10$.

Things I Want to Remember

Lesson 13: Introduction to Two-Variable Inequalities

Try This!

The Theater Club makes \$5 for every student ticket they sell, x , and \$7 for every adult ticket, y . They want to make at least \$180 to buy costumes for their next show.

1.1 Explain how you know this situation is an example of a constraint.

1.2 Which inequality or equation represents this situation?

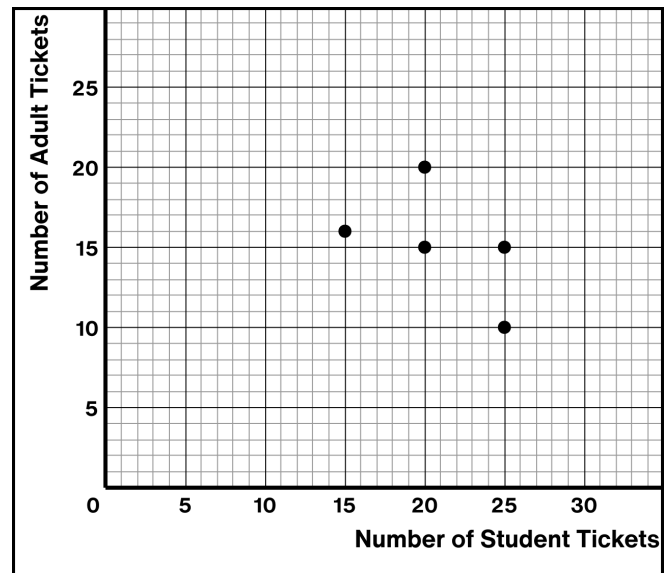
- A. $5x + 7y \leq 180$ B. $5x + 7y = 180$ C. $5x + 7y \geq 180$ D. $7y = 5x + 180$

This graph shows some solutions to the Theater Club's situation.

2.1 Choose one solution: _____

Explain what it means in the situation.

2.2 Show that this point is a solution to the inequality you chose in problem 2.



2.3 Choose another solution that is **not** shown on the graph.

Show or explain how you know it is a solution.

- ☐ I can interpret what two-variable inequalities represent in a situation.
- ☐ I can show and explain what it means to be a solution to a two-variable inequality.

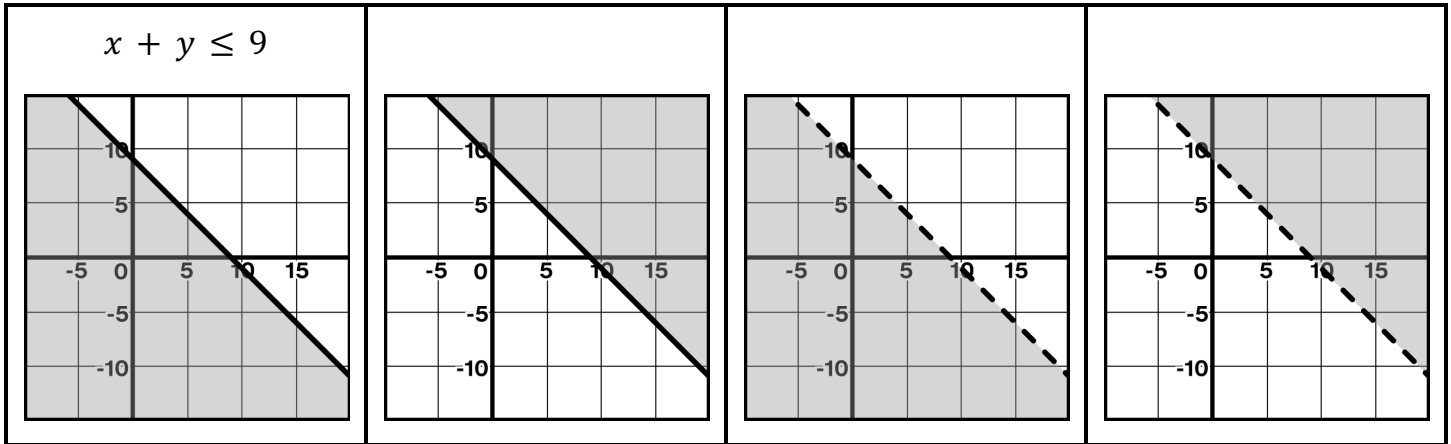
Lesson 14: Graphing Solutions to Two-Variable Inequalities

Summary

All the solutions to a two-variable linear inequality are represented on a graph as a half-plane.

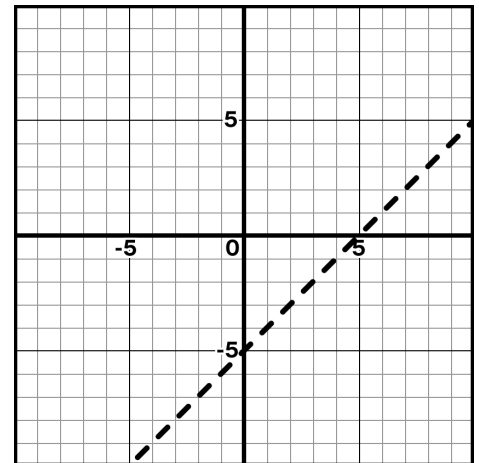
The graph on the left represents **all** the solutions to the inequality $x + y \leq 9$.

Write inequalities to match each of the remaining three graphs.



Juliana is graphing the solutions to $x - y < 5$.
Why is her line dashed?

Graph the solutions to $x - y < 5$.
Test points in the inequality to help with your thinking.



Things I Want to Remember

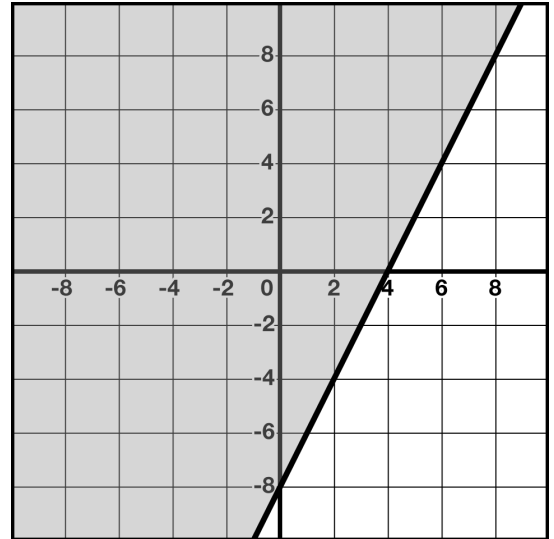
Lesson 14: Graphing Solutions to Two-Variable Inequalities

Try This!

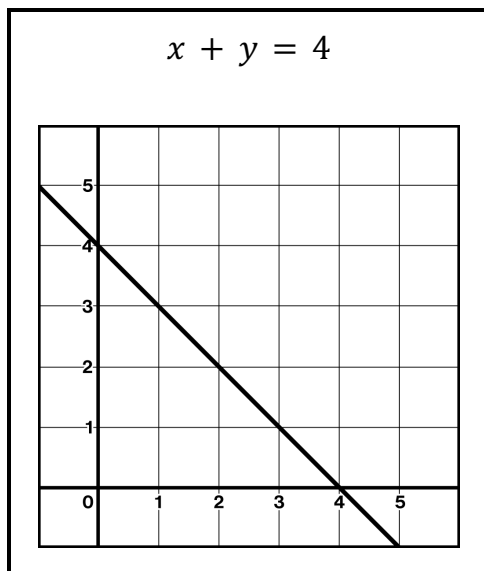
1. Which inequality does this graph represent?

- A. $2x - y > 8$ B. $2x - y \geq 8$
C. $2x - y < 8$ D. $2x - y \leq 8$

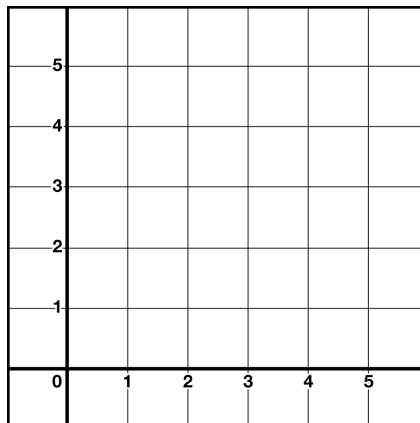
Show or explain your thinking.



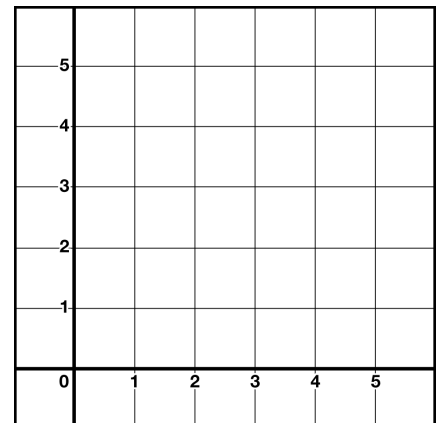
Here is a graph of $x + y = 4$. Graph the solutions to each of the following inequalities:



2.1 $x + y < 4$



2.2 $x + y \leq 4$



- ☐ I understand how solutions to a two-variable linear inequality are represented on a graph.
☐ I can graph the solutions to a linear two-variable inequality given the graph of its corresponding line.

Lessons 15–16: Graphing Two-Variable Inequalities in Context

Summary

Solutions to two-variable inequalities on a graph can help us analyze situations and make decisions.

A group of students is installing a garden at their school. A vegetable bed will cost \$15 per square foot to install and a flower bed will cost \$12 per square foot. Their budget for the project is \$300.

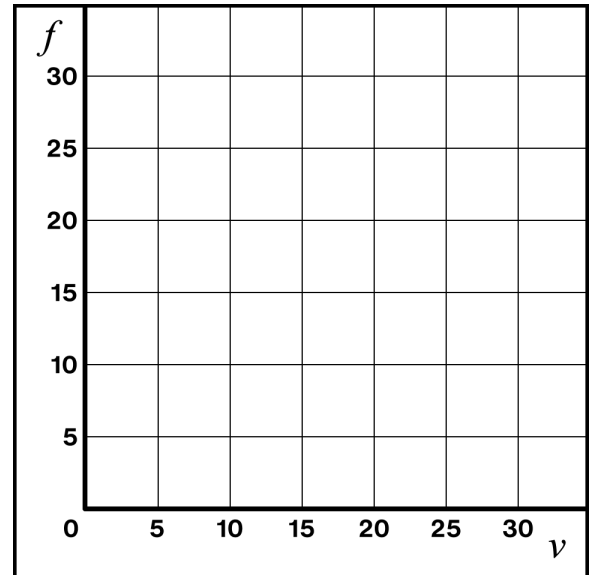
If $15v + 12f \leq 3\,000$ represents the situation, define v and f .

v represents . . .

f represents . . .

Graph the equation $15v + 12f = 300$.
Use the table if it helps with your thinking.

v	f



Shade in the region that represents the solutions to the inequality $15v + 12f \leq 300$.

How many square feet of type of bed would you recommend the students plant? Why?

Things I Want to Remember

Lessons 15–16: Graphing Two-Variable Inequalities in Context

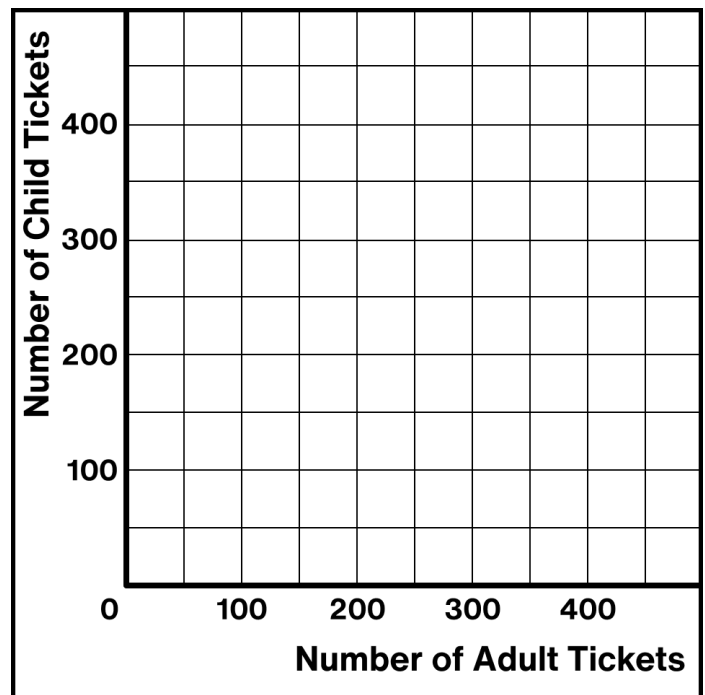
Try This!

A theater needs to make at least \$1 800 during each performance so that it can pay the actors and other workers. Each adult ticket costs \$12 and each child ticket costs \$8.

1. Write an inequality to represent this situation.
 - Use x to represent the number of adult tickets sold.
 - Use y to represent the number of child tickets sold.

2. Graph the solutions to your inequality.

Use an equation or a table if it helps with your thinking.

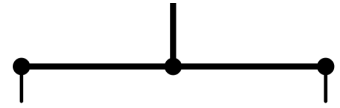


3. Write a question that the theater could answer using the graph.

- ☐ I can graph the solutions to a two-variable linear inequality and interpret its solutions in context.
- ☐ I can use two-variable linear inequalities to analyze an issue in society.

Warm-Up

1. Draw a hanger that represents $3x + 5 = 4x + 1$.



Practice

2. Determine the solution to the equation from the warm-up: $3x + 5 = 4x + 1$.

3. Determine the solution to this equation: $5 = x + 1 + 3x$.

Draw a hanger if it helps with your thinking.

Solve each equation for x .

4.1 $3x + 19 = 40$

4.2 $4x + 18 = 6x$

4.3 $2x + 11 = 8x + 5$

4.4 $3(x + 1) = 30$

Unit A1.2, Lesson 1: Practice Problems

Looking Back

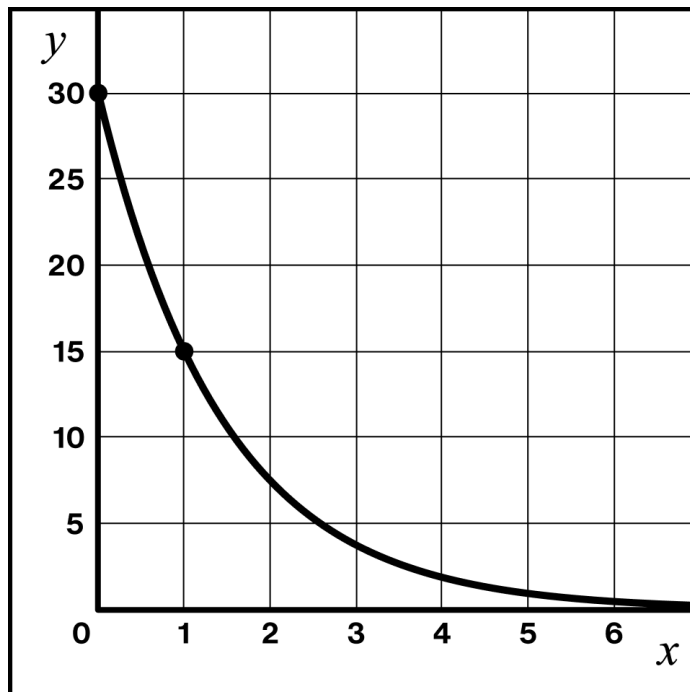
5. Which equation matches this graph?

A. $y = 30 - 15x$

B. $y = 30 \cdot \left(\frac{1}{2}\right)^x$

C. $y = 30 \cdot 2^x$

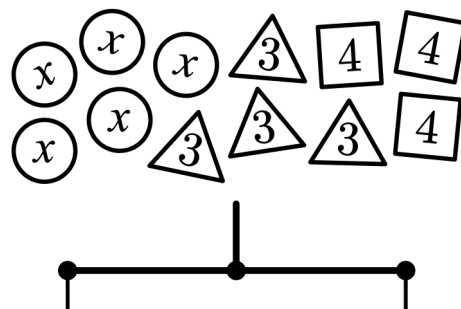
Explain how you decided which equation matched the graph.



Explore

6.1 Create a hanger using **all** of these shapes:

- 5 circles
- 4 triangles
- 3 squares



6.2 Determine the value of x that will balance it.

Reflect

1. Star the problem you spent the most time on.
2. Use the space below to ask a question or share something you are proud of.

Warm-Up

1. Select **all** of the equations where $x = 0.5$ is a solution.

☐ $8 = 10 + 4x$

☐ $13 + 7x = 20 - 7x$

☐ $3x + 8 = 9.5$

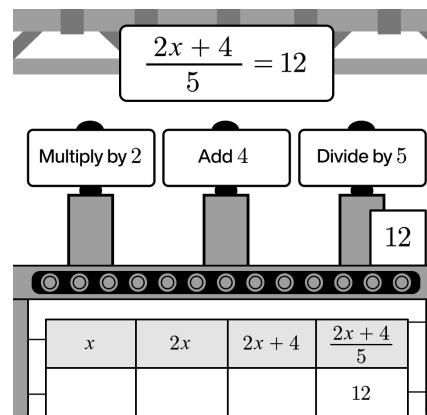
☐ $4 = -2x + 6$

☐ $5x = -2 + x$

Practice

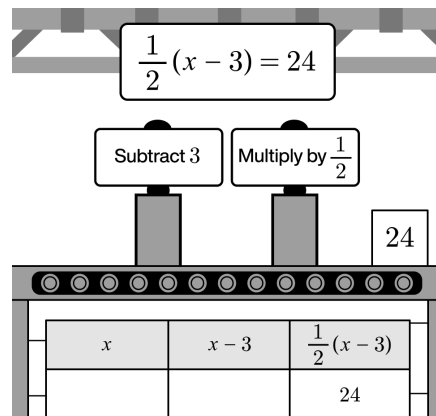
2. Here is a machine for the equation $\frac{2x+4}{5} = 12$.

Solve this equation for x .



3. Here is a machine for the equation $\frac{1}{2}(x - 3) = 24$.

Solve this equation for x .



4. Solve for x : $5(3x - 2) = -55$

5. Solve for x : $\frac{6x-2}{2} = x + 9$

Unit A1.2, Lesson 2: Practice Problems

Zwena made a mistake when solving $3(x - 4) = 5x$ for x .

6.1 Show or explain her mistake.

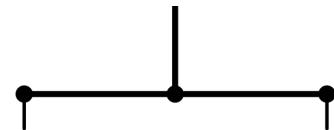
6.2 What is the correct solution to this equation?

Step 1:	$3(x - 4) = 5x$
Step 2:	$3x - 12 = 5x$
Step 3:	$8x - 12 = 0$
Step 4:	$8x = 12$
Step 5:	$x = 1.5$

Explore

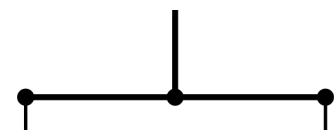
7.1 Create a hanger using all of these shapes so that the value of x is positive and **as small as possible**.

- 5 circles
- 4 triangles
- 3 squares



7.2 Create a hanger using all of these shapes so that the value of x is positive and **as large as possible**.

- 5 circles
- 4 triangles
- 3 squares



Reflect

1. Put a heart next to the problem you feel most confident about.
2. Use the space below to ask a question or share something you are proud of.

Warm-Up

1. For each equation, determine whether or not $x = -2$ is a solution.

$$5 - 2x = 9$$

Solution / Not a solution
(Circle one.)

$$12 + 3x - 4 = 14$$

Solution / Not a solution
(Circle one.)

$$3x + 5 - 10x = 19$$

Solution / Not a solution
(Circle one.)

Practice

2. *Equivalent equations* have exactly the same solutions.

Select **all** of the equations that are equivalent to $3x - 12 = 24$.

☐ $15x - 60 = 120$

☐ $3x = 12$

☐ $3x = 36$

☐ $x - 4 = 8$

☐ $x = 12$

For each problem, two of the equations are equivalent to the highlighted equation, and one is not.

Circle the equation that **is not** equivalent to the highlighted equation.

3. $5x - 3 = 2x + 15$

A. $7x - 3 = 15$

B. $5x = 2x + 18$

C. $-3 = -3x + 15$

Show or explain your thinking.

4. $8(x + 3) = 40$

A. $8x + 24 = 40$

B. $x + 3 = 32$

C. $x + 3 = 5$

Show or explain your thinking.

5. $6x + 4 + x = 25$

A. $7x + 4 = 25$

B. $6x^2 + 4 = 25$

C. $6x + x = 21$

Show or explain your thinking.

Unit A1.2, Lesson 3: Practice Problems

6. Here are the equations from problems 3–5. Circle one equation and solve it for x .

$$5x - 3 = 2x + 15$$

$$8(x + 3) = 40$$

$$6x + 4 + x = 25$$

7. Write two equations that are equivalent to $3(x - 4) = 18 + 2x - 11$.

Equation 1:

Equation 2:

Looking Back

8. Joel has \$10.50 for beans and rice.

- Beans cost \$5 per pound.
- Rice costs \$2 per pound.

Complete the table showing three ways Joel can spend exactly \$10.50 on beans and rice.

Pounds of Beans, b	Pounds of Rice, r
2	
	3
7	

Reflect

1. Put a question mark next to a problem you would like to compare with a classmate.
2. Use the space below to ask a question or share something you are proud of.

Warm-Up

1. Renata scored 409 points in a video game. This was 223 more points than Sadia scored, s .

Which equation **does not** represent this situation?

A. $223 = 409 - s$

B. $s = 409 - 223$

C. $s = 409 + 223$

D. $223 + s = 409$

Practice

Solve each equation.

2.1 $26 - 2x = 3(x + 2)$

2.2 $\frac{4x-6}{2} = x - 8$

2.3 $\frac{1}{4}x - 5 = x - 14$

- 3.1 Which equation is equivalent to $6x + 9 = 12$?

- 3.2 Write another equation that is equivalent to $6x + 9 = 12$.

A. $x + 9 = 6$

B. $2x + 3 = 4$

C. $3x + 9 = 6$

D. $6x + 12 = 9$

Unit A1.2, Lesson 4: Practice Problems

4. Select **all** equations that are equivalent to $\frac{-8x-6}{2} = 15$.

☐ $4x + 3 = 15$

☐ $\frac{1}{2}(-4x - 3) = 15$

☐ $-4x - 3 = 15$

☐ $-\frac{1}{2}(8x + 6) = 15$

☐ $8x + 6 = 30$

Polina made a mistake when solving $-3(x + 7) = 24$ for x .

5.1 What is one thing that Polina did well?

5.2 What is one thing that she did incorrectly?

Step 1: $-3(x + 7) = 24$

Step 2: $x + 7 = 27$

Step 3: $x = 20$

6. Which equation is equivalent to $0.05n + 0.1d = 3.65$?

A. $5n + d = 365$

B. $0.5n + d = 365$

C. $5n + 10d = 365$

D. $0.05d + 0.1n = 365$

Explore

7. Using the digits 0–9 without repeating, fill in each blank to create a true statement.

$$\boxed{}(\boxed{}x - \boxed{}) = \boxed{}\boxed{}$$

Solution: $x = \boxed{}$

Warm-Up

1. Select **all** the equations where $x = 2$ is a solution.

A. $\frac{x}{4} = 8$

B. $19 = 2(x + 6) + 3$

C. $2x + 10 = 2x + 8$

D. $5 - 3x = -1$

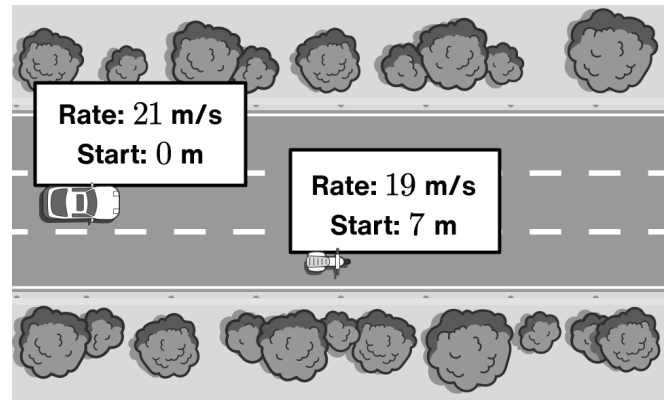
E. $4 - x = x$

Practice

2. The car and scooter are moving at constant speeds.

The time, t , when they will be in the same position is represented by $21t = 19t + 7$.

When will the car and scooter be in the same position?



3. The time, t , when two vehicles will be in the same position is represented by $10t = 2.5t$.

When will these two vehicles be in the same position?

A. Once

B. Never

C. Always

4. Here is Kaindra's work to solve $16x = 10x$.

She says there is no solution.

Is this correct? Show or explain your thinking.

$$\begin{array}{r} 16x = 10x \\ \times \quad \times \\ 16 = 10 \end{array}$$

There is no solution.

Unit A1.2, Lesson 5: Practice Problems

5. Sort the equations by their number of solutions by writing the letter of the equation in the appropriate column.

A. $5t = 3t$

B. $2t = 10 - 2t$

C. $15 - 3(t + 5) = -3t$

D. $4t + 7 = 4(t + 2)$

E. $6t + 2 = -3 + 6t$

One Solution	No Solution	Infinite Solutions

Looking Back

6. Select **all** the expressions that are equivalent to $2(x + 3)$.

☐ $(x + 3) \cdot 2$

☐ $2x + 6$

☐ $2x = 3 \cdot 2$

☐ $2x + 3$

☐ $2x + 5$

Explore

7. Using the digits 0–9, fill in each blank to create two different equations where the solution is $x = 1$.

You may use the digits more than once.

Explain what you notice about your equations.

$$\boxed{}x + \boxed{} = \boxed{}x + \boxed{}$$

$$\boxed{}x + \boxed{} = \boxed{}x + \boxed{}$$

Reflect

- Star the problem that you spent the most time on.
- Use the space below to ask a question or share something you are proud of.

Warm-Up

1. Select **all** the expressions that are equivalent to $8 - 12 - (6 + 4)$.

☐ $(6 + 4) - 8 - 12$

☐ $8 - 6 - 12 + 4$

☐ $8 - 12 - 6 - 4$

☐ $8 - (6 + 4) - 12$

Practice

Adriana spent \$24 on fruit punch and lemonade.

Fruit punch costs \$3 per bottle. Lemonade costs \$2 per bottle.

- 2.1 How many bottles of **fruit punch** could Adriana buy if she did not get any lemonade?

- 2.2 How many bottles of **lemonade** could Adriana buy if she did not get any fruit punch?

Adriana wrote this equation to represent the situation: $3F + 2L = 24$.

- 3.1 Use the equation to help you complete the table.

- 3.2 Which equation represents the same relationship?

A. $L = 12 - \frac{3}{2}F$

B. $L = 8 - \frac{3}{2}F$

C. $L = 8 - \frac{2}{3}F$

D. $L = 12 - \frac{2}{3}F$

F	L
2	
6	

Here is an equation: $2x + 4y = 80$.

- 4.1 Use the equation to help you complete the table.

- 4.2 Which equation represents the same relationship?

A. $y = 20 - 2x$

B. $y = 40 - 2x$

C. $y = 20 - \frac{1}{2}x$

D. $y = 40 - \frac{1}{2}x$

x	y
6	
12	

Unit A1.2, Lesson 6: Practice Problems

5. Nia is buying bananas and apples for her family. Bananas cost \$0.50 each. Apples cost \$1.00 each. Select **all** combinations of bananas and apples that Nia could buy for exactly \$3.50.

☐ 1 banana and 3 apples

☐ 5 bananas and 1 apple

☐ 3 bananas and 2 apples

☐ 1 banana and 2 apples

☐ 5 bananas and 2 apples

Looking Back

6. Here are two equations.

Equation A

$$48 - 5x = 13$$

Equation B

$$5x = 35$$

Explain how you know that these equations are equivalent.

Explore

7. Using the digits 0–9 without repeating, create two equivalent equations.

$$\boxed{}x + \boxed{}y = \boxed{}$$

$$y = \boxed{} - \boxed{}x$$

Reflect

- Put a star next to one question you are still wondering about.
- Use the space below to ask a question or share something you are proud of.

Warm-Up

1. Deven ran 27 miles last week, which was three times as far as Hailey ran.

Select **all** of the equations that represent the number of miles Hailey ran, h .

☐ $h = \frac{1}{3} \cdot 27$

☐ $3 \cdot h = 27$

☐ $h = 3 \cdot 27$

☐ $\frac{1}{3} \cdot h = 27$

☐ $h = 27 \div 3$

Practice

Solve each equation for y .

2.1 $6(2.5) - 4y = 11$

2.2 $6x - 4y = 11$

Here is an equation: $2x - 4y - 31 = 123$.

3.1 Solve for x .

3.2 Solve for y .

4. Abdel wants to spend \$12 on beans and rice.

- Beans, b , cost \$5 per pound.
- Rice, r , costs \$2 per pound.

Abdel wrote $5b + 2r = 12$ to represent this relationship.

Complete the table.

Pounds of Beans, b	Pounds of Rice, r
2	
0.6	
b	

Unit A1.2, Lesson 7: Practice Problems

Solve each equation for the specified variable.

5.1 Solve for b .

$$\frac{bh}{2} = A$$

5.2 Solve for w .

$$2l + 2w = P$$

5.3 Solve for d .

$$C = 2\pi d$$

Explore

6. Here is an equation: $x + 3y = 6$.

Use the whole numbers 0–6 without repeating to create two (x, y) coordinate pairs that are solutions and one that is not.

	x	y
Solution		
Solution		
Not a Solution		

Reflect

- Put a question mark next to a question you were feeling stuck on.
- Use the space below to ask a question or share something you are proud of.

Warm-Up

1. Select **all** the equations where $x = -2$ is a solution.

☐ $4x = 4 + 2x$

☐ $19 = 2(x - 6) + 3$

☐ $2(x + 5) = x + 8$

☐ $5 + 3x = -1$

☐ $3x - 5 = 1$

Practice

- 2.1 A teacher bought packs of stickers and packs of pencils for her class. She spent \$21.

- Stickers cost \$1.50 per pack.
- Pencils cost \$3.50 per pack.

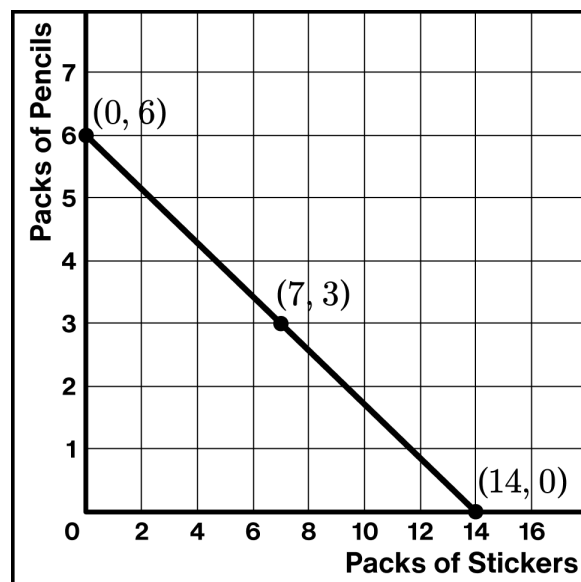
Show or explain how you know this graph represents this situation.

- 2.2 Circle a coordinate and explain what it means in this situation.

(0, 6)

(7, 3)

(14, 0)



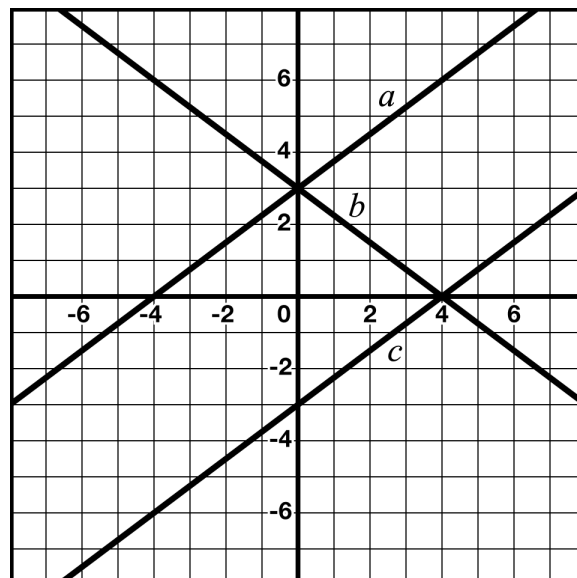
3. Which line represents $12 = 3x + 4y$?

A. Line a

B. Line b

C. Line c

Show or explain how you know.



Unit A1.2, Lesson 8: Practice Problems

4. Which equation is equivalent to $15x + 3y = 2$?

A. $y = \frac{2}{3} + 5x$

B. $y = \frac{2}{3} - 5x$

C. $y = 2 - 15x$

D. $y = 2 - 5x$

Looking Back

5.1 Solve for y : $-3x + 4y = 28$

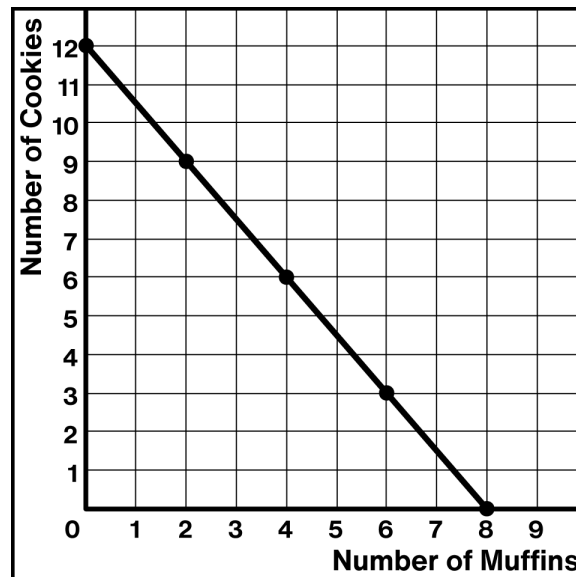
5.2 Solve for y : $6x - 3y = 36$

6. Jordan had a bake sale. Muffins cost \$3 each and cookies cost \$2 each. Jordan earned \$24.

Here is a graph of Jordan's situation.

Select **all** the combinations of muffins and cookies they could have sold.

- ☐ 0 muffins and 8 cookies
- ☐ 9 muffins and 2 cookies
- ☐ 2 muffins and 9 cookies
- ☐ 6 muffins and 4 cookies
- ☐ 4 muffins and 6 cookies



Reflect

- Put a smiley face next to a question you were stuck on and then figured out.
- Use the space below to ask a question or share something you are proud of.

Warm-Up

1. Select **all** the equations that have no solution.

☐ $2t + 1 = 1 + 2t$

☐ $2t + t = 2t + 1$

☐ $2(t + 1) = 2t + 1$

☐ $2t + 1 = 2t$

☐ $2t = 1$

Practice

A school sells adult tickets and student tickets for a play. Adult tickets cost \$8 each and student tickets cost \$4 each. They collected \$320 in total.

- Use a for the number of adult tickets sold.
- Use s for the number of student tickets sold.

2.1 Which equation represents this relationship?

A. $8a + 4s = 320$

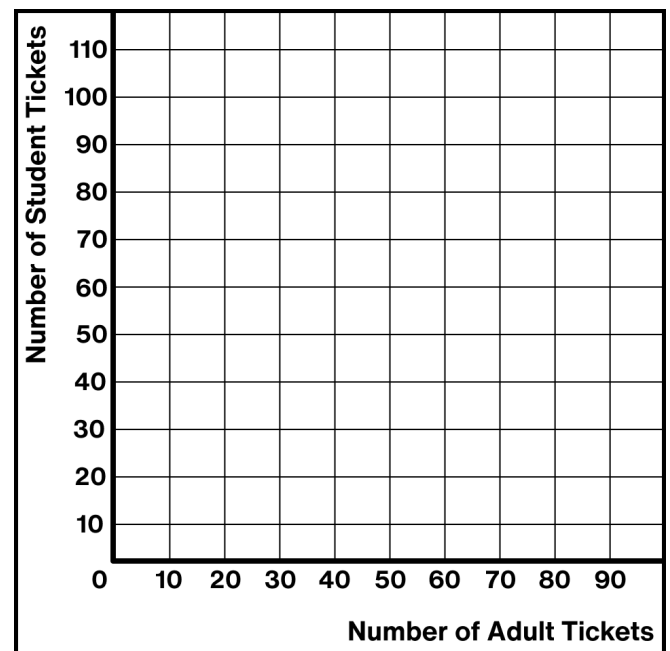
B. $8s + 4a = 320$

C. $8a \cdot 4s = 320$

D. $a + s = 320$

2.2 **Make a graph** showing this relationship.
Use the table if it helps with your thinking.

Number of Adult Tickets, a	Number of Student Tickets, s

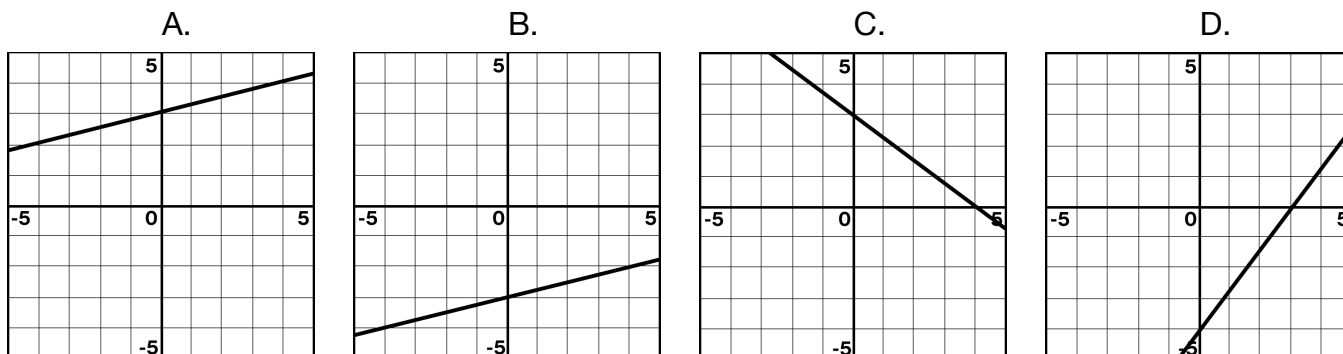


Here's an equation: $-1x + 4y = 12$.

3.1 Solve $-1x + 4y = 12$ for y to show that it is equivalent to $y = 3 + \frac{1}{4}x$.

Unit A1.2, Lesson 9: Practice Problems

3.2 Which graph matches these equations?



Explain your thinking.

4. Match each graph to two equations. You will have one equation left over.

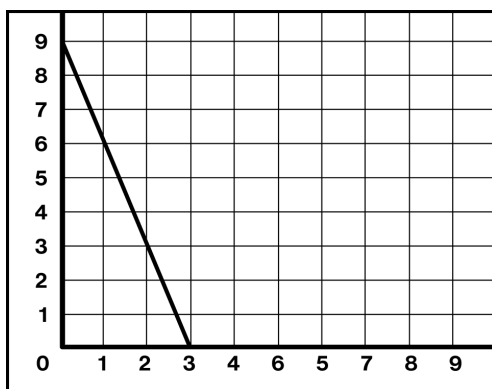
A. $y = 6 - \frac{1}{3}x$

B. $2y + 6x = 18$

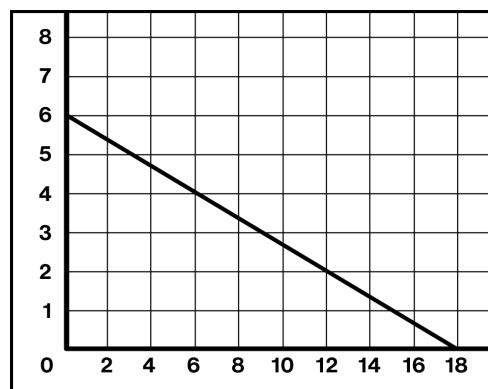
C. $y = 9 - 3x$

D. $6y + 2x = 36$

E. $3y + 6x = 18$



Equation _____ Equation _____



Equation _____ Equation _____

Looking Back

5. Write at least three different equations that are equivalent to $\frac{1}{2}(-10x + 2) = 6$

1.

2.

3.

Warm-Up

1. For each constraint, write the letter of the matching inequality.

A. $a \leq 10$	B. $a > 10$	C. $a \geq 10$
----------------	-------------	----------------

_____ a is less than or equal to 10.

_____ a is as much as 10.

_____ a is greater than or equal to 10.

_____ a is at most 10.

_____ a is at least 10.

_____ a is greater than 10.

Practice

2. Marquis wants to work at least 20 hours a week to earn enough money for a concert. Which inequality represents x , the number of hours Marquis wants to work?

A. $x > 20$

B. $x < 20$

C. $x \leq 20$

D. $x \geq 20$

3. Demetrius can spend as much as \$50 on shirts. Shirts, s , cost \$16 each at a nearby store. Which inequality represents this situation?

A. $50s \leq 16$

B. $50s \geq 16$

C. $16s \geq 16$

D. $16s \leq 50$

Explain your thinking.

4. List **at least three** values for x that would make $8 + 2x \leq 20$ true.

Unit A1.2, Lesson 10: Practice Problems

Write an inequality for each constraint. Use t for time (in hours).

5.1 Trevor practices his clarinet at least 1 hour each day.

5.2 At some colleges, students must work 20 hours per week or less.

5.3 The American Academy of Pediatrics recommends teenagers play video games for no more than 2 hours each day.

Write a constraint for each inequality. Be sure to specify what the variables represent.

6.1 $x \geq 3$

6.2 $5 > y$

Looking Back

Solve each equation.

7.1 $4x - 6 = 12 - 2x$

7.2 $\frac{1}{3}x - 8 = 12 - 3x$

7.3 $2x + 7 - 3x = \frac{5}{2}$

Reflect

1. Circle a question you want to talk to a classmate about.
2. Use the space below to ask a question or share something you are proud of.

Practice

1. Match each statement to the inequality.

$$h > 50$$

h is greater than **or** equal to a number

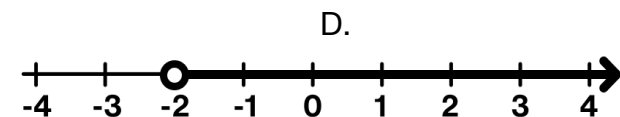
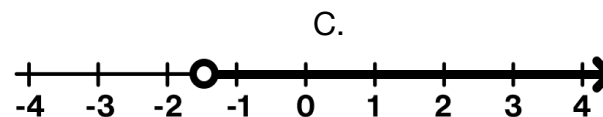
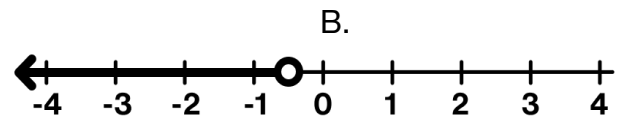
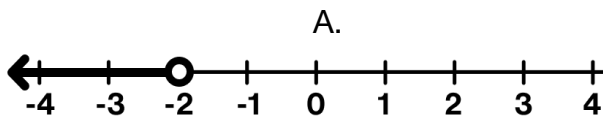
$$30 \leq h$$

h is less than **or** equal to a number

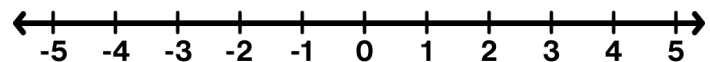
$$h \leq 20$$

h is greater than a number

2. Which graph represents the solutions to $2x < -4$?

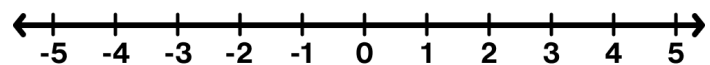


3. Graph the solutions to $2x < 10$ on the number line. Then explain your thinking.



4. Leo is solving $15 + x < -14$. He knows the solutions to $15 + x = -14$ is $x = 1$.

How can he determine whether the solutions to $15 + x < -14$ are $x < 1$ or $x > 1$?



5. Diego says that $x = 5$ is a solution to the inequality $-3x > 9$ because when you divide both sides by -3 , you get $x > -3$. Is this correct?

Explain your thinking.

Unit A1.2, Lesson 11: Practice Problems

A community pool offers two different membership plans:

- Plan A: \$4 per visit
- Plan B: An initial \$12 fee, then \$2 per visit

Brielle wants to spend \$48 dollars to swim at the community pool this month.

6.1 How many times could she visit the pool with Plan A?

6.2 How many times could she visit the pool with Plan B?

6.3 Nekeisha says that it is cheaper for her to use Plan A than Plan B.

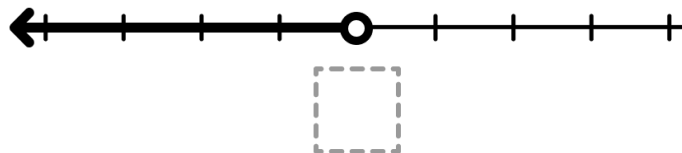
Write an inequality to represent this situation.

Use x for the number of visits to the pool.

Explore

7. Using the digits 0–9 without repeating, fill in each blank to create an inequality and the graph of its solutions.

$$\boxed{}x + \boxed{} > \boxed{}x$$



Reflect

1. Put a question mark next to a problem you would like to compare with a classmate.
2. Use the space below to ask a question or share something you are proud of.

Warm-Up

1. Imani is going shopping with a budget of \$125.
Which inequality represents the amount of money that Imani can spend while shopping?

A. $x > 125$

B. $x \leq 125$

C. $x \geq 125$

D. $x < 125$

Practice

2. Here is Isabella's work solving the inequality
 $7x + 5 > 2x + 35$.

Explain how solving the equation helps Isabella solve the inequality $7x + 5 > 2x + 35$.

$$7x + 5 > 2x + 35$$

$$7x + 5 = 2x + 35$$

$$5x = 30$$

$$x = 6$$

3. Solve this inequality: $-3x + 4 \geq 12$. Use the number line if it helps with your thinking.



Solve each inequality.

4.1 $4x + 5 \geq 37$

4.2 $-6x + \frac{x}{2} < 7$

4.3 $-8x - 6 > 2x - 26$

Unit A1.2, Lesson 12: Practice Problems

4. Here is an inequality: $7x + 6 < 3x + 2$. Select **all** the values that are solutions.

☐ $x = 1$

☐ $x = 0$

☐ $x = -1$

☐ $x = -2$

☐ $x = -8$

Rudra takes medicine every day. The equation $y = 24\left(\frac{1}{2}\right)^x$ represents the amount of medicine in Rudra's body (in milligrams) x hours after he takes it.

6.1 How much medicine does Rudra take?

6.2 How much medicine is still in his body after 1 hour?

Explore

7. Using the digits 0–9, fill in each blank such that the two inequalities are equivalent.

$$\boxed{}x + \boxed{} < \boxed{}x + \boxed{}$$

$$x > \boxed{}$$

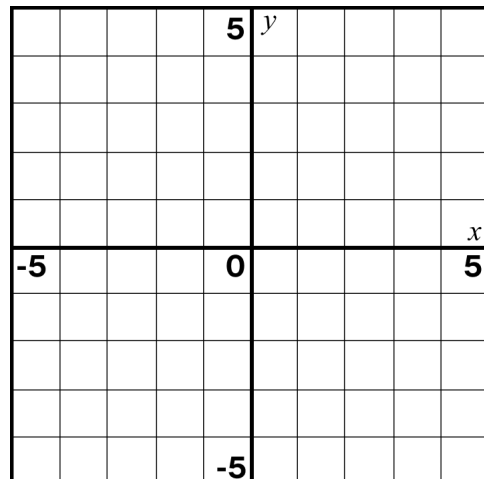
Reflect

- Put a star next to a question that looked more difficult than it really was.
- Use the space below to ask a question or share something you are proud of.

Warm-Up

1. Plot and label each point on the graph.

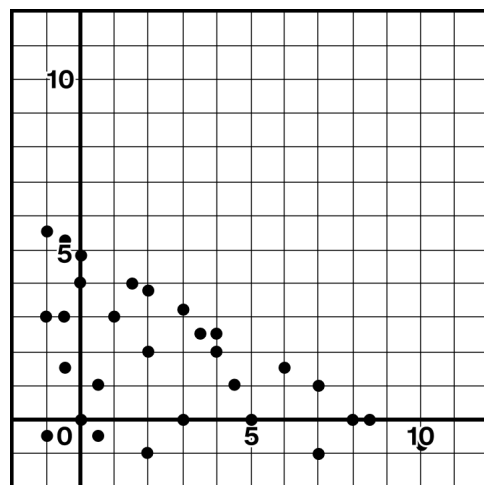
A	B	C	D	E
$(-4, 0)$	$(4, 0)$	$(3, -4)$	$(0, 4)$	$(-1, -2)$



Practice

1. This graph shows some solutions to $5x + 9y < 45$. Select **all** of the points that are also solutions.

- ☐ $(1, 1)$
- ☐ $(4, 0)$
- ☐ $(10, 4)$
- ☐ $(0, 10)$
- ☐ $(6, -1)$

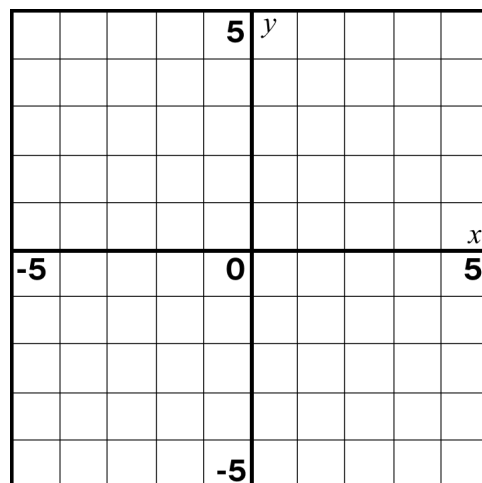


2. Here is an inequality: $x \leq y$.

Write at least three coordinate pairs that are solutions to this inequality.

Use the graph if it helps with your thinking.

(x, y)
1.
2.
3.



Unit A1.2, Lesson 13: Practice Problems

Tyler can spend up to \$45 on shirts and socks. A shirt costs \$10 and a pair of socks cost \$2.50.

- 4.1 Which inequality represents this situation?
- Use t for the number of shirts.
 - Use p for the number of pairs of socks.
- A. $10t + 2.50p > 45$
 B. $10t + 2.50p < 45$
 C. $10t + 2.50p \geq 45$
 D. $10t + 2.50p \leq 45$

4.2 Explain how you know $t = 2$ and $p = 1$ are solutions in this situation.

Looking Back

Write an inequality to show each situation.

5.1 Duri will stay warm in their sleeping bag when the temperature is at least 30°F.
 Use t to represent temperatures where Duri will stay warm in their sleeping bag.

5.2 Duri wants their backpack to weigh less than 45 pounds.
 Use w to represent weights where Duri can carry their backpack.

Here is an equation: $6x + 2y = 36$.

6.1 For each value of x , determine the value of y .

x	y
2	
4	

6.2 Which equation represents the same relationship?

- A. $y = 6 - 3x$ B. $y = 18 - \frac{1}{3}x$ C. $y = 18 - 3x$ D. $y = 6 - \frac{1}{3}x$

Warm-Up

1. Select **all** of the inequalities that are true when $x = 5$.

☐ $x < 2$

☐ $x < 10$

☐ $x < 5$

☐ $x \geq 5$

☐ $x \geq 8$

Practice

Here is a graph of the equation $x + 2y = 7$.

- 2.1 Which of these points (x, y) is a solution to the inequality $x + 2y < 7$?

A. $(0, 0)$

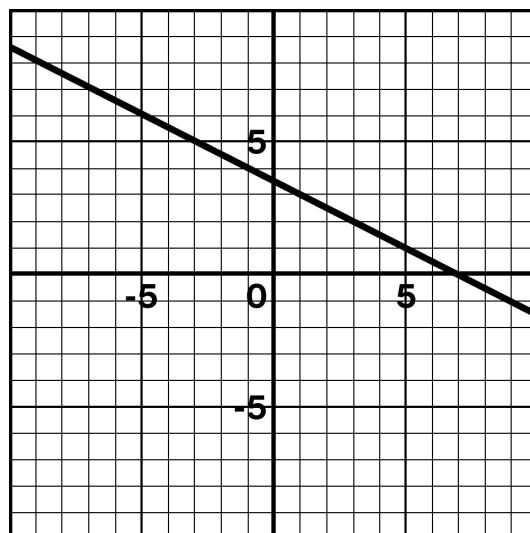
B. $(7, 0)$

C. $(0, 7)$

D. $(10, 0)$

- 2.2 Complete the graph of $x + 2y < 7$.

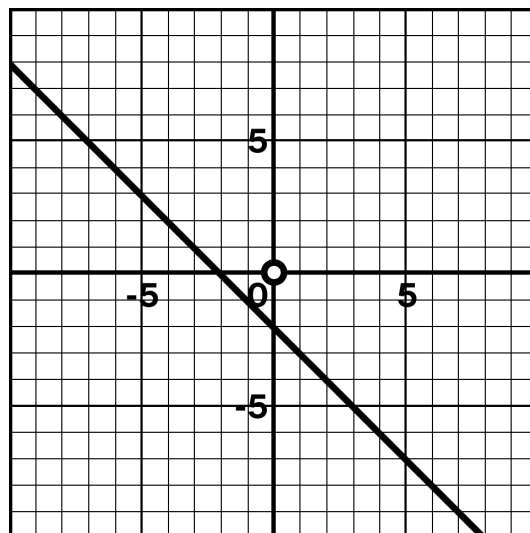
Explain how you decided which region to shade.



3. Here is an inequality: $x + y \leq -2$.

- Ada graphed the equation $x + y = -2$.
- Ada noticed that $(0, 0)$ is **not** a solution to $x + y \leq -2$.

How can Ada use this information to graph the solutions to this inequality?



Unit A1.2, Lesson 14: Practice Problems

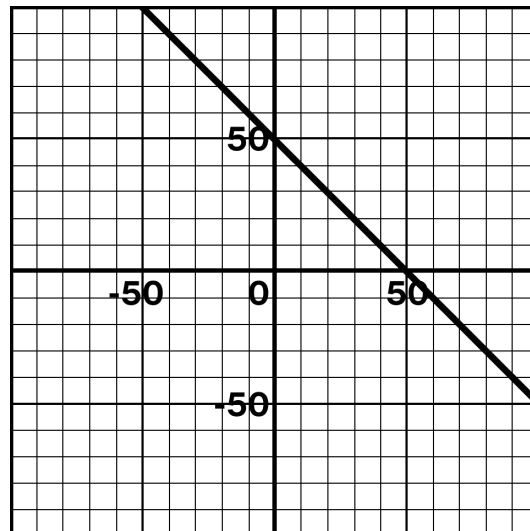
A food truck only sells hot dogs and hamburgers.
They want to sell 50 items or more each day.

4.1 Which inequality represents this situation?

A. $x + y > 50$ B. $x + y > 50$

C. $x + y \geq 50$ D. $x + y \leq 50$

4.2 Complete the graph so that it represents all the solutions to the inequality for this situation.

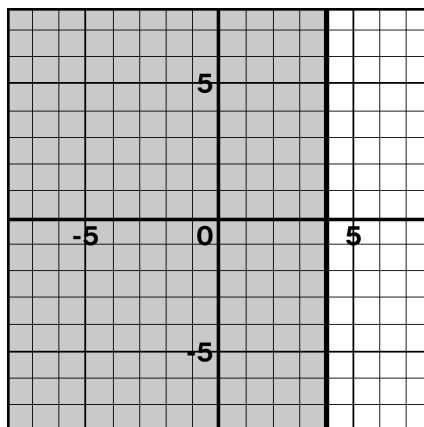


For each graph, write the letter of the inequality that matches it.

You will have two inequalities left over.

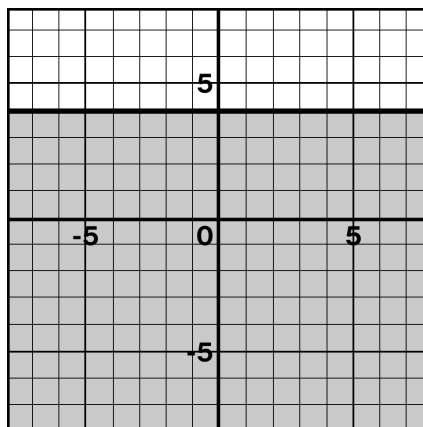
A. $4 > x$	B. $4 \geq y$	C. $y < 4$	D. $x > 4$	E. $x \leq 4$
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5.1



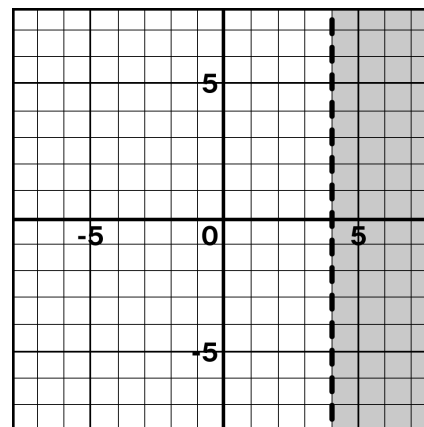
Inequality _____

5.2



Inequality _____

5.3



Inequality _____

Looking Back

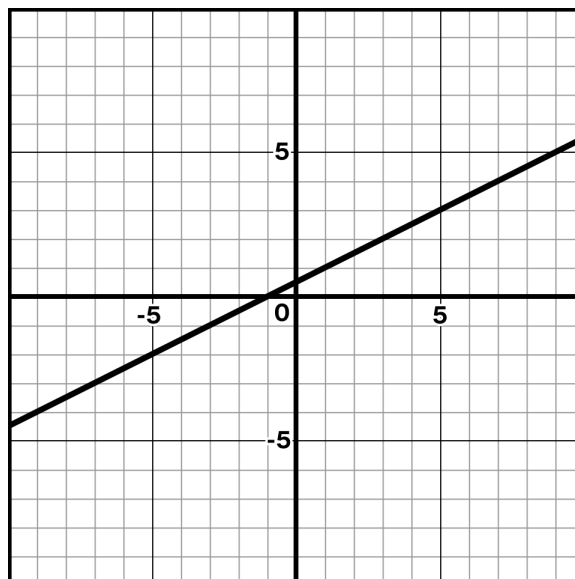
6. Write two equations that are equivalent to $2(3x - 1) = 6 + 4x - 10$.

Warm-Up

1. Here is the graph of the **equation** $2y - x = 1$.

Select **all** the points that are solutions to the equation.

- ☐ $(-7, -2)$ ☐ $(5, -2)$
- ☐ $(-1, 0)$ ☐ $(9, 6)$
- ☐ $(0, 0.5)$

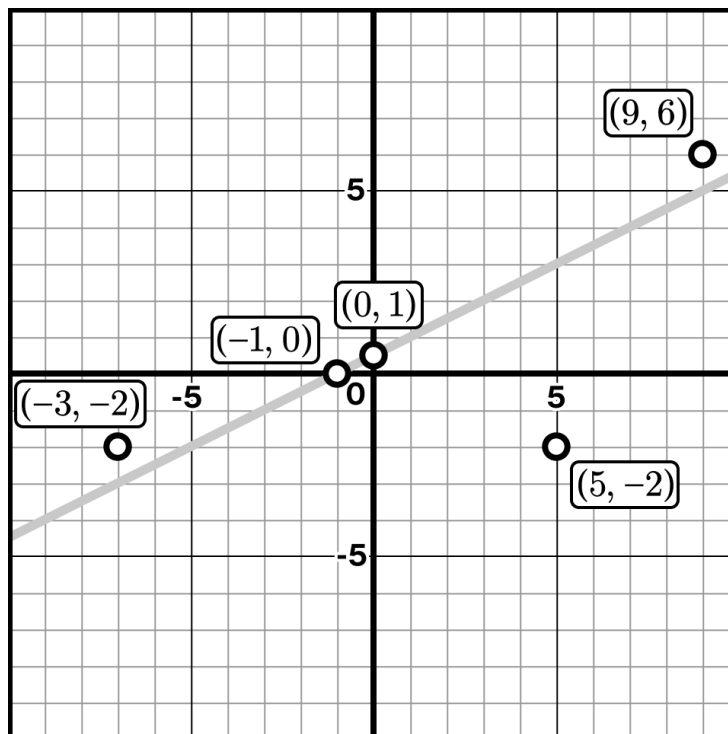


Practice

Here is an **inequality**: $2y - x > 1$.

- 2.1 On the graph, shade **all** the points that are solutions to this inequality.

- 2.2 Draw on the graph to show all of the solutions to $2y - x > 1$.



3. Select **all** the coordinates that are solutions to $5x + 9y < 45$.

- ☐ $(0, 0)$ ☐ $(5, 0)$ ☐ $(9, 0)$ ☐ $(0, 5)$ ☐ $(0, 9)$

Unit A1.2, Lesson 15: Practice Problems

4. Mia is buying snacks for a movie night with her friends. Her budget is \$60.

A package of popcorn costs \$5.00 and a package of candy costs \$2.50.

Write an inequality that represents the packages of popcorn and candy she can buy for \$60 or less. Use p for packages of popcorn and c for packages of candy.

Josiah and his baseball team have \$800 to buy jerseys and helmets.

Jerseys cost \$40 each. Helmets cost \$60 each.

- 5.1 **Write an inequality** to represent the number of jerseys, j , and helmets, h , the team can buy with \$800.

- 5.2 If the team needs 5 jerseys, how many helmets can they buy?

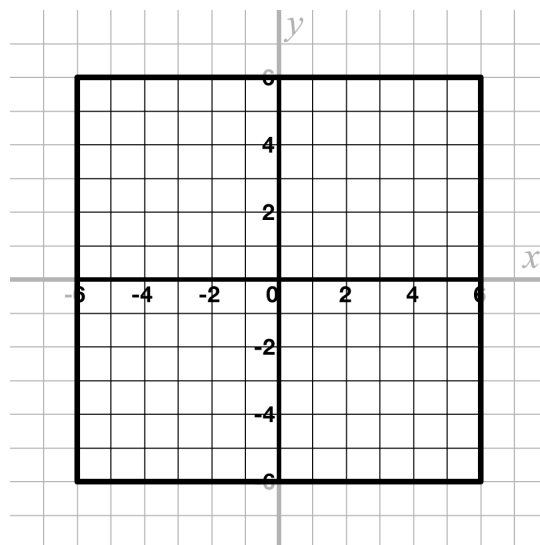
6. Which equation is equivalent to $0.3x + 0.06y = 4.3$?

- A. $3x + 6y = 43$ B. $30x + 60y = 43$
C. $3x + 0.6y = 430$ D. $30x + 6y = 430$

Explore

7. Here is a graph in the shape of a square.

Write an inequality such that the graph shades $\frac{1}{4}$ of the square.

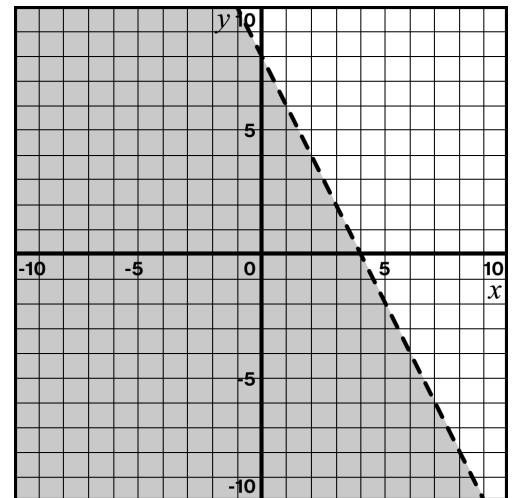


Warm-Up

1. Here is the graph of the inequality $y \leq 8 - \frac{1}{2}x$.

Select **all** the points that are solutions to the inequality.

- | | |
|-------------------------------------|-----------------------------------|
| <input type="checkbox"/> $(-5, 0)$ | <input type="checkbox"/> $(5, 5)$ |
| <input type="checkbox"/> $(10, 2)$ | <input type="checkbox"/> $(4, 0)$ |
| <input type="checkbox"/> $(-2, -6)$ | |



Practice

2. Gabriel is selling tickets to a fundraising concert for the school band.
His goal is to raise **more than** \$145.

- Youth tickets, y , cost \$3 each.
- Adult tickets, a , cost \$5 each.

Which inequality represents the number of tickets Gabriel must sell to achieve his goal?

- | | |
|-----------------------|-----------------------|
| A. $3y - 145 > 5a$ | B. $3y + 5a \geq 145$ |
| C. $3y + 5a \leq 145$ | D. $3y + 5a > 145$ |

3. Farmer Farah has a \$100 000 budget for planting strawberries and peas.

- Planting strawberries costs \$500 per acre.
- Planting peas costs \$200 per acre.

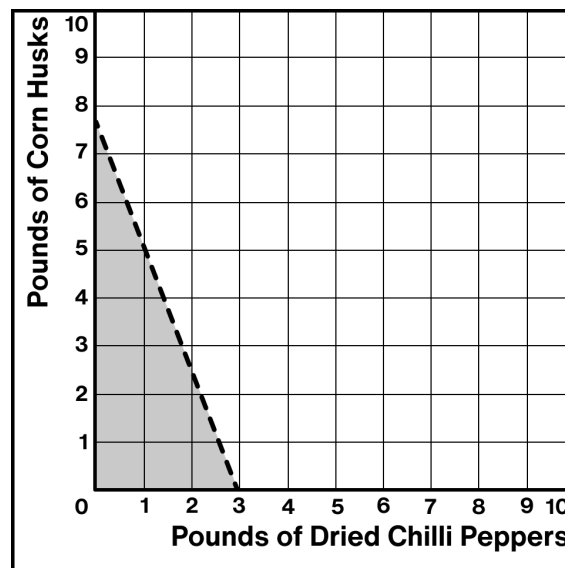
Write an inequality to describe how many acres of strawberries, s , and peas, p , Farmer Farah can grow with \$100 000.

Unit A1.2, Lesson 16: Practice Problems

Ramon is buying ingredients to make tamales. He wants to spend less than \$50 total for d pounds of dried chili peppers and h pounds of corn husks.

The graph represents this situation.

- 4.1 Can Ramon buy 2 pounds of dried chili peppers and 4 pounds of corn husks for less than \$50?
- 4.2 Can Ramon buy 1.5 pounds of dried chili peppers and 3 pounds of corn husks for less than \$50?
- 4.3 Explain how you determined your choices.



Looking Back

5. Select **all** of the equations that are equivalent to $3x + 5 = 20 - x$.

☐ $4x = 15$

☐ $-4x + 20 = -5$

☐ $2x = 25$

☐ $x - 20 = 5 + 3x$

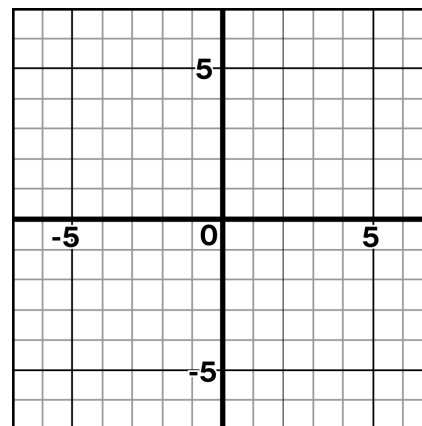
☐ $4x - 15 = 0$

6. Solve for y : $-6x + 3y = 24$.

Explore

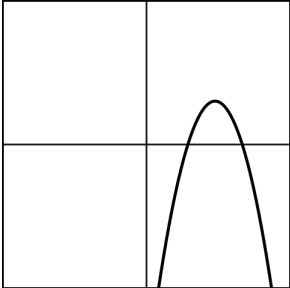
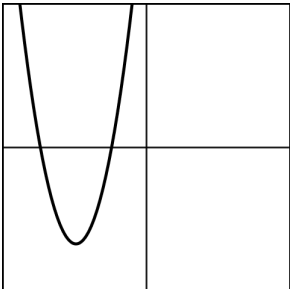
7. Here is a square.

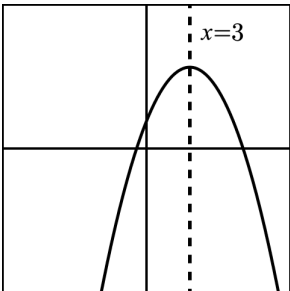
Write and graph up to four different inequalities to create a design.

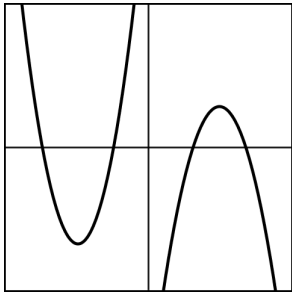


desmos

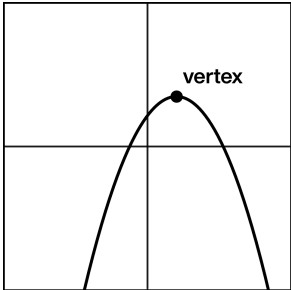
Algebra 1 Glossary

Term	Definition										
concave down	<p>A parabola that opens downward.</p> <p>A negative value of a will produce a <i>concave down</i> parabola.</p> <p>The parabola to the right has an equation of $f(x) = -1(x - 4)^2 + 2$.</p> 										
concave up	<p>A parabola that opens upward.</p> <p>A positive value of a will produce a <i>concave up</i> parabola.</p> <p>The parabola to the right has an equation of $f(x) = 2(x + 6)^2 - 5$.</p> 										
constant difference	<p>When the difference between any two consecutive values in a pattern is the same, there is a <i>constant difference</i>.</p> <p>The table on the right has a constant difference of 2.</p> <table data-bbox="1206 1029 1450 1329"> <thead> <tr> <th>x</th><th>y</th></tr> </thead> <tbody> <tr> <td>0</td><td>5</td></tr> <tr> <td>1</td><td>7</td></tr> <tr> <td>2</td><td>9</td></tr> <tr> <td>3</td><td>11</td></tr> </tbody> </table>	x	y	0	5	1	7	2	9	3	11
x	y										
0	5										
1	7										
2	9										
3	11										
constant ratio	<p>When the ratio between any two consecutive values in a pattern is the same, there is a <i>constant ratio</i>.</p> <p>The table on the right has a constant ratio of 3.</p> <table data-bbox="1206 1402 1450 1696"> <thead> <tr> <th>x</th><th>y</th></tr> </thead> <tbody> <tr> <td>0</td><td>1</td></tr> <tr> <td>1</td><td>3</td></tr> <tr> <td>2</td><td>9</td></tr> <tr> <td>3</td><td>27</td></tr> </tbody> </table>	x	y	0	1	1	3	2	9	3	27
x	y										
0	1										
1	3										
2	9										
3	27										

<p>constraint</p>	<p>A constraint is a limitation on the possible values of variables in a model.</p> <p>We often use equations or inequalities to represent constraints.</p> <p>The constraint that “you must be 36 inches or taller to ride the ferris wheel” can be represented by the inequality $h \geq 36$.</p>										
<p>equivalent equations</p>	<p>Equivalent equations have the same solutions.</p> <p>These equations are equivalent because if you multiply the top equation by 3, you create the bottom one. The solution to each equation is $x = 2$.</p> <div style="text-align: right;"> $3x + 4 = 10$ $9x + 12 = 30$ </div>										
<p>exponential relationship</p>	<p>Relationships (patterns, tables, scenarios) that increase or decrease by a constant ratio.</p> <p>For example, $y = 2 \cdot 4^x$ represents an exponential relationship that starts at 2 and grows by a constant ratio of 4.</p> <p>The table on the right shows $y = 2 \cdot 4^x$.</p> <div style="float: right;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 5px;">x</th><th style="padding: 5px;">y</th></tr> </thead> <tbody> <tr> <td style="padding: 5px;">0</td><td style="padding: 5px;">2</td></tr> <tr> <td style="padding: 5px;">1</td><td style="padding: 5px;">8</td></tr> <tr> <td style="padding: 5px;">2</td><td style="padding: 5px;">32</td></tr> <tr> <td style="padding: 5px;">3</td><td style="padding: 5px;">128</td></tr> </tbody> </table> <div style="margin-left: 10px;"> $\begin{matrix} & \nearrow \cdot 4 \\ & \nearrow \cdot 4 \\ & \nearrow \cdot 4 \end{matrix}$ </div> </div>	x	y	0	2	1	8	2	32	3	128
x	y										
0	2										
1	8										
2	32										
3	128										
<p>factored form</p>	<p>One of three common forms of a quadratic equation.</p> <p>It looks like $f(x) = a(x - m)(x - n)$.</p> <p>The equations to the right are all in factored form.</p> <div style="text-align: right;"> $g(x) = x(x + 10)$ $2(x - 1)(x + 3) = y$ $y = (5x + 2)(3x - 1)$ </div>										
<p>line of symmetry</p>	<p>If you fold a parabola along the <i>line of symmetry</i>, the two halves are identical. This is sometimes called an <i>axis of symmetry</i>.</p> <p>The equation of this <i>line of symmetry</i> is $x = 3$.</p> <div style="text-align: right;">  </div>										

linear relationship	<p>Relationships (patterns, tables, scenarios) that increase or decrease by a constant difference.</p> <p>For example, $y = 5 + 6x$ represents a linear relationship that starts at 5 and grows by a constant difference of 6.</p> <p>The table on the right shows $y = 5 + 6x$.</p>	<table><tr><th>x</th><th>y</th></tr><tr><td>0</td><td>5</td></tr><tr><td>1</td><td>11</td></tr><tr><td>2</td><td>17</td></tr><tr><td>3</td><td>23</td></tr></table>	x	y	0	5	1	11	2	17	3	23
x	y											
0	5											
1	11											
2	17											
3	23											
model	<p>A mathematical representation (graph, equation, relationship) of real-world data that you can use to make predictions and decisions, or to solve problems.</p>											
parabola	<p>The graph of a quadratic function.</p>											
quadratic equation	<p>An equation used to represent a quadratic function.</p> <p>Quadratic equations contain a squared term.</p> <p>There are three common forms of quadratic equations:</p> <ul style="list-style-type: none">Factored form: $f(x) = a(x - m)(x - n)$Standard form: $f(x) = ax^2 + bx + c$Vertex form: $f(x) = a(x - h)^2 + k$											
quadratic function	<p>A <i>quadratic function</i> has output values that change by a constant second difference.</p> <p>Equations of quadratic functions have a squared term as the highest degree.</p> <p>The graph of a quadratic function is a parabola.</p>	<table><tr><th>x</th><th>f(x)</th></tr><tr><td>1</td><td>8</td></tr><tr><td>2</td><td>11</td></tr><tr><td>3</td><td>16</td></tr><tr><td>4</td><td>23</td></tr></table>	x	f(x)	1	8	2	11	3	16	4	23
x	f(x)											
1	8											
2	11											
3	16											
4	23											

second difference	<p>The differences between consecutive output values in the table of a function are called first differences.</p> <p>The differences between those values are called second differences.</p> <p>In this example, the first differences are 3, 6, 9, and 12. The second differences are all 3.</p>	<table><tr><th>x</th><th>f(x)</th></tr><tr><td>1</td><td>5</td></tr><tr><td>2</td><td>8</td></tr><tr><td>3</td><td>14</td></tr><tr><td>4</td><td>23</td></tr><tr><td>5</td><td>35</td></tr></table> <p><i>(Handwritten annotations show first differences: 8-5=3, 14-8=6, 23-14=9, 35-23=12. Second differences: 6-3=3, 9-6=3, 12-9=3.)</i></p>	x	f(x)	1	5	2	8	3	14	4	23	5	35
x	f(x)													
1	5													
2	8													
3	14													
4	23													
5	35													
solution	<p>A solution is a value or set of values that makes an equation or inequality true.</p> <p>For example, $x = 2$ is a solution to the equation $3x + 4 = 10$.</p> <p>$x > 2$ is the solution to the inequality $3x + 4 > 10$.</p> <p>The ordered pair $(1, 2)$ is a solution to the equation $3x + 4y = 11$.</p>													
standard form	<p>One of three common forms of a quadratic equation.</p> <p>It looks like $f(x) = ax^2 + bx + c$.</p> <p>The equations to the right are all in standard form.</p>	$y = 2x^2 + 5x + 3$ $h(x) = x^2 + 3x$ $4x^2 - 7 = f(x)$												
standard form (of a linear equation)	<p>Standard form of a linear equation looks like $ax + by = c$, where a, b, and c are constants and x and y are variables.</p> <p>The equations on the right are in standard form.</p> <p>The equation $y = 2x + 4$ is not in standard form.</p>	$3x + 4y = 10$ $9x - 12y = 4$												
translation	<p>A translation moves every point in a figure a given distance in a given direction.</p> <p>It changes the location of a function, but does not change its shape.</p>													

<p>vertex</p>	<p>The vertex is the point where a parabola changes from increasing to decreasing, or vice versa.</p> <p>It is the highest or lowest point on the graph.</p> 
<p>vertex form</p>	<p>One of three common forms of a quadratic equation.</p> <p>It looks like $f(x) = a(x - h)^2 + k$.</p> <p>The equations to the right are all in vertex form.</p> <div> $(x - 3)^2 + 10 = g(x)$ $y = 2(x + 8)^2 - 1$ $f(x) = -(x - 6)^2 + 15$ </div>
<p>vertical stretch</p>	<p>The result of multiplying the output values of a function by a factor.</p> <p>When a function is vertically stretched, the y-values of its graph move away from or toward the x-axis.</p>